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A modern highway intersection in New Jersey

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Building Boulder City for the Hoover Dam Job

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ENGINEERING NEWS-RECORD

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F. E. Schmitt, Editor

NOVEMBER 26, 1931

Steel Tunnel Lining

CONSERVATIVE judgment is displayed in the Colorado River Board's decision to line the Boulder Dam pressure tunnels with steel where they penetrate the canyon walls below the dam. The contract drawings called for steel lining only in the smaller penstock and outlet valve tunnels; the larger main tunnels, 30 and 50 ft. in diameter, were to be concrete-lined, in connection with elaborate pressure grouting of the surrounding rock. The pressures involved are not high as steel penstock pressures go, but they are high for pressure tunnels, especially with such limited rock cover as that between the tunnels and the canyon walls in the present case. However carefully the concrete be placed and the grouting done, there would remain danger that cracks might develop and that seams not reached by grout might permit the escape of water under pressure, or even allow the building up of dangerous pressures outside the tunnel walls. Steel lining will eliminate this hazard. Its relatively small additional cost is insignificant in relation to the insurance it gives.

Use of Idle Time

UNEMPLOYED engineers have two problems on their hands—to find a job and to find use for their idle time. The first is the more important and the more difficult to solve, but the second if ignored may ultimately affect a man's ability to solve the first by breaking down his morale. Both problems have been taken into consideration in the movements now on foot to aid engineers out of work. In New York the engineers' unemployment committee's attack on the second problem has been successful on one front: Columbia University has announced that within the limits of lecture hall capacity its lecture courses will be thrown open to bona fide engineers who are out of work. This cooperation on the part of the university will make it possible for idle men to refresh their memory on old subjects or to expand their knowledge in new fields. Knowledge of new fields will expand a man's capacity for taking the first job that offers. Such a solution of the second problem will help to make solution of the first less difficult.

A Premium on Destitution?

IN THE administration of emergency work programs for the approaching winter many cities have placed the assignment of jobs in the hands of established social agencies. These latter are accustomed to basing their relief actions primarily on the needs of the applicant for work, and this practice is unavoidable since limited funds make it vital to use the money where it will do most good. But it should be recognized that undesirable consequences can result from a policy that leads to confining jobs to those in most desperate circumstances. An unemployed workman who still has some cash resources is in a less favorable position when seeking employment than his fellow who is already down to bedrock. His relative affluence keeps him from a job, and he feels that he must wait until he too becomes desperate before he can expect to get work. In short, the policy places a premium upon destitution. Charity administration finds such a course acceptable and indeed advisable, but it may become dangerous to public morale in the present circumstances. Administrators should recognize the danger of their position and do their utmost to avoid at any rate the appearance of placing a high value on destitution.

Free Labor for Roads

DESPITE the disadvantage of winter's approach, state highway departments are taking a praiseworthy part in the movement to provide winter jobs for unemployment relief. The methods adopted vary. Virginia has put into effect a stagger system for both maintenance and construction forces, adding 2,500 names to the payroll. Ohio will build more than 300 small bridges. New Jersey has 1,600 men at work on such operations as widening existing roads, clearing and grading sidewalk spaces and embankments, installing drainage structures, and doing maintenance work of every kind on which hand labor can predominate. Many other examples could be cited. Such efforts show a definite determination to aid in the solution of the outstanding economic and political problem of the year. It is not easy for highway officials to break away from the inbred tradition that winter is the time for planning and summer for execution. They must meet and conquer difficulties incident to exhausted appropriations, low labor efficiency, weather hazards and the remoteness of possible projects from the centers of population where most of the labor must originate. But to regard these factors as a bar to action, as they are in normal times, is now a confession of weakness.

Efficient Construction

RECENT inspection of the flood-protection work along the Mississippi amply confirms prior observation to the effect that the construction work is of praiseworthy excellence. That fact should not be forgotten or undervalued in the important and unavoidably controversial discussion of the faults or omissions of the fundamental planning. Congress is quite certain to inquire into the basic plan, the floodway litigation, the engineers' failure to raise the west-bank levees along the disputed floodways to a safe protective height, and other sore points of the existing situation. But while so doing, it should in all fairness give credit to the skillful care displayed in design, specification, and supervision by the engineers, to the high quality of the contractors' methods and performance, and to the resulting excellence of the structures built. What has been done along the Mississippi is entitled to high rank as efficient construction.

Plug Small Leaks

WATER conservation sometimes is necessarily tied to the execution of a large-scale program. But not always does effective action need to be slow or depend on a comprehensive plan. Simple improvements in regulation may be able to produce a saving in available supplies. A case in point is the recent Wyoming order which requires reservoir owners to begin storing water this fall, as soon as the streams carry surplus over the demands of prior rights. The ruling carries with it the possible penalty of charging the surplus water allowed to bypass before storage is completed against the 1932 rights for that reservoir. In Wyoming reservoir rights are superior to ditch rights of subsequent date, and in reliance on this advantage reservoir owners have sometimes delayed the beginning of storage until late in the season. The resulting interference with junior ditch rights downstream is prevented by the present order. Thus by simple regulation the state is able to effect a valuable conservation of its water resources and protect users who otherwise might suffer damage. The principle of the order fulfills the premise that water supplies should be regulated for the greatest public good. Although no other state may have exactly comparable conditions, the situation illustrates what may be done by directing thoughtful attention not only to the large programs but also to the minor problems of water utilization.

Preserved for Posterity

REALIZATION of a hope expressed in these pages a few weeks ago, the hope that some way might be found to preserve interesting engineering structures and mechanical appliances for posterity, appears to be nearer than many know. In Chicago the Museum of Science and Industry, made possible by munificent gifts of Julius Rosenwald, is rapidly assembling many relics of engineering progress in the rehabilitated Fine Arts Building of the 1893 World's Fair. Some exhibits will be the actual structure or machine; others will be full- or small-scale models. They will be more than a miscellaneous and unrelated collection of engineering antiques; as outlined in a letter elsewhere in this issue, every effort will be made to show *progressive* development. In thus setting up a visible record of engineering progress this country has lagged behind Europe. In 1924 a movement to start a national museum was started, but it lacked support —both sympathetic and financial—and did not succeed. Now in addition to the Chicago museum New York has a very presentable nucleus of a museum of science and industry but one lacking the financial support that has made the great size and detail of the Chicago museum possible. These two museums cannot but help stimulate greater interest elsewhere. We may confidently look forward to the time when no significant engineering or industrial development will fail to find its place in permanent records of progress.

Construction Unity

NEXT week the Construction League, new-formed body to bring into cooperation all of the interests concerned in engineering construction and building, is to take its first step forward. The League's policy committee, which is the real governing body, will meet to mark out the line of advance. As we said not long ago (*ENR*, Oct. 22, 1931, p. 639), the new movement will depend for success on some intangible power over stubborn and self-centered men, to persuade them into working together. It is most timely that such power should be discovered and applied, for these are the dark days of construction, and especially of building. And while the blame rests more largely on finance than on the technical arts, yet the planners and builders have sins of their own to ponder. Greatest of all is their lack of unity. Once they bind themselves into an industrial group determined to wipe out the internal evils and weaknesses of the industry and united in its attitude toward those whom the industry serves and by whom it is served, the road forward will be clearer. All, we are sure, await with interest a statement of the League's definite plans.

More Lightweight Floors

IT IS a popular supposition, in general borne out by history, that new-product development flourishes in periods of business depression. Currently, there is no marked trend in this direction, but one new product in the structural field stands out above any other. This is the lightweight floor, and more particularly the steel floor. For some years steel-joist floors with concrete slabs have had wide acceptance. The steel floor attempts to outdo them. The idea originated several years ago when the American Institute of Steel Construction conceived the idea of promoting steel plate floors, long used on ships and in furnace charging floors, for general service. It met with fair success and found application in numerous buildings and bridges. While light in weight, the steel plate floor was not economical for heavy loads and the recent trend has been toward other forms of greater carrying capacity. Several of these are ingenious and promising. Made either of pressed steel or of rolled structural shapes, these new floor systems are strong enough for almost any loading. In building construction they will provide an immediate and substantial working platform for the building trades, and as they come to the job in prefabricated units of considerable size they should tend to speed up construction and eliminate storage of materials on the job. Suitably protected top and bottom by fireproof materials, some of these floors weigh as little as 60 lb. per sq.ft. for loads as great as 600 lb. These are substantial contributions toward meeting recognized needs. Development of the lightweight steel floor is an example of what engineering ingenuity can produce when given the necessary impetus. If manufacturers in other fields will exercise some of their latent ingenuity in developing other new products, this period of business depression may not be without its advantages.

Power Checks St. Lawrence Planning

INTEREST in pending negotiations for a St. Lawrence treaty now centers largely in water power rather than in navigation. This curious situation comes about because the question of who controls the power in navigable streams has never been definitely settled on either side of the international border. Both here and in Canada it is thoroughly established that the federal government has a paramount right to control or to develop rivers in the interests of navigation, but in neither country does the basic act establishing the federal government definitely give it a proprietary control over water power developed along such streams.

In this country the federal water-power act assumes that the federal government has that right, that because it is empowered by the Constitution to control the construction of dams on navigable streams it also has the right to control power developed at such dams. Presumably the same theory of right extends to international rivers. This broad assumption of authority has never been reviewed by the Supreme Court. Private utility interests have been reluctant to pit themselves against the federal government in attacking a law that at times operates to their advantage. More recently, however, state governments found federal authority being used to invade what they believe to be their rights, and therefore raised question as to the constitutionality of the water-power act, a question that should have been settled long ago.

That question comes up now to confuse and delay the St. Lawrence canal treaty negotiations. Control over 2,000,000 hp. of electric energy, half in this country and half in Canada, is at stake. New York State has definitely asserted its claim to absolute control over the power to be developed on this side of the border and insists that the federal government acknowledge its right, thus settling the chief domestic problem before taking up international ones. The federal government, on the other hand, has curtly told New York State's representatives that it proposes to negotiate the treaty first, leaving domestic questions to be settled afterward. This is done, presumably, because the treaty can then be used as a club to force New York State into accepting its views as to the federal government's right to control power as well as navigation. Across the border similar questions about federal against provincial rights are at issue, as are questions concerning the canal's cost and effect on existing traffic. There, however, the federal government appears inclined to settle its domestic difficulties first.

Thus, at a time when the subject of water-power development generally has suffered an eclipse it is forced to the front in national interest, not because the power in question is badly needed but because control of future water-power development, and to a considerable extent all future power regulation, largely turn on how the present differences are settled. If the federal government's right to control power development on navigable streams and their major tributaries is established, then such control and regulation will be more and more a federal matter; if the federal rights are more limited, then control of power may revert to the state.

Early this year eminent legal advisers of New York State advised against raising question as to the constitutionality of the federal power act—although they believed that it could be attacked successfully—because of the delays involved. Now that the Washington administration, by its brusque treatment of the state's representatives, has made an issue of the state's rights on the St. Lawrence River, it is highly probable that the state will put the federal government's assumed rights to a test.

Water power thus occupies, and for some time will occupy, the center of the stage set for the preliminaries to development of the international section of the St. Lawrence River. Engineering and economic questions and cost allocation are standing in the wings waiting for their cue. No work may start along the river until all have been heard.

Stabilizing Industry

SIGNIFICANCE extending far beyond the industry affected attaches to the discussion of wage adjustments now in progress between railroad executives and the heads of the railroad labor brotherhoods. This is so because of the great size and essential character of the industry, its highly uniform rate of employment, the extent to which its employees are organized into powerful and well-managed unions, and, finally, because of the way in which the method of paying many railroad employees approaches the ideal of having actual pay fluctuate with volume of business. If any industry can make a success of some one of the recently proposed plans for stabilizing employment it should be the railroads.

Already the pay of enginemen and trainmen, within certain limits, fluctuates according to the amount of business handled by the railroad they serve, regardless of the basic rate of pay. If by some further devices all railroad pay can be made even more responsive to changes in income, and thereby the number of men employed can be kept more nearly constant, one of the objectives of the stabilization movement will be attained. To accomplish this, it would be necessary also that the negotiators put into concrete form nebulous plans for reducing unemployment within the industry by reducing hours of employment in dull times and for setting up a reservoir of casual labor from which needed temporary labor may be drawn.

But though it might be possible to apply some of these stabilization measures to the railroad industry, other proposals for stabilization seem quite impossible. These include such things as unemployment insurance, and the proposed setting aside of funds during good times to be spent in dull times. Railroads pay out $7,000,000 *every day* in wages. The very magnitude of the fund that must be set up within the industry to carry even a fraction of its employees through a long period of depression serves to emphasize the futility of such proposals. Also, funds set aside for such equalization work or for unemployment insurance cannot be held in cash. They must be put to work by being invested in securities. But when cash is needed the securities must be sold and sold at a loss on a depressed market.

Stabilization of industry by making the actual pay of its employees more responsive to the prosperity of the industry itself has much to commend it. A second and more fundamental step will have been taken when the pay of capital will be made similarly responsive. But attempts to hold back the pay of either labor or capital to be spent at some indeterminate future date may turn out to have more effect in deepening the valleys of depression than in filling them.

Field Observations of Highway Practices

Intersection Design a Primary Highway Problem in New Jersey

By C. S. HILL
Associate Editor,
Engineering News-Record

Heavy Philadelphia-New York intercity traffic and enormous pleasure travel to seashore resorts calls for many elaborate road-crossing structures

NEW JERSEY has a major highway-intersection problem. Its highway traffic is heavy and on certain main roads it reaches an intensity surpassed only in congested metropolitan areas. New York and Philadelphia and their surrounding cities have their highway connection through New Jersey. The most visited seashore resorts in the world dot the state's coast line from Atlantic Highlands to Cape May. New York on every holiday and throughout the summer pours its thousands down the coast roads to these resorts. Philadelphia sends its thousands fanwise across the state to the same goals for recreation. Highway traffic on the roads numbers from 20,000 to 60,000 vehicles in 24 hours.

To meet these traffic conditions, the New Jersey highway department has had not only the problem of constructing wide paved highways but of diverting these roads around centers of population and preventing traffic interruption where roads cross. Its practices in bypass road construction were described in *Engineering News-Record*, Jan. 1, 1931, p. 12. This article presents observations on practices in constructing intersections throughout the state.

Functions and Types

The principal functions of a highway intersection are: (1) to provide for the interchange of traffic between one route and another; and (2) to provide for the crossing of four streams of traffic. The relative demands of these functions vary at every intersection. One requirement may predominate and the other be very small, or the two may be equal, or dominance may pass from one requirement to the other as traffic develops. The possible permutations and combinations are many, and the number does not remain constant. Obviously standards of design and construction are not contemplated. Each intersection is a separate problem, and as traffic develops the solution adopted may be found after a time to meet poorly the changed requirements.

Practice, however, recognizes a degree of classification into types. For example, straight grade separation, grade separation with connecting ramps, the traffic circle and the flared intersection are quite distinct types. There are other type distinctions based on traffic movements. All are shown among the intersections illustrated. None of them has standard form and arrangements, as may be seen by comparing the several illustrations. Characteristics of any number of them may be combined in one intersection.

The simplest of the types is the flared intersection; also, from the economic standpoint, it should be of interest to a greater number of highway engineers than any other illustrated. A flared intersection constructed in 1929 near Toms River, N. J., is shown in Fig. 1, although this is not a particularly advanced example of the application of the principle. Flaring has not received the attention it deserves, especially where funds are not available for one of the higher types of intersection. The principle of flaring can be applied so as to increase remarkably the normal number of lanes of traffic in the area common to both roads. With sufficient flaring it would be theoretically possible to pass the normal capacity of each road through the intersection. Practically, without a traffic light and spacing control, this would be hazardous and impossible, but the efficacy of flaring in increasing the capacity of the intersection is undeniable. The extra space allows left-turn traffic to wait in the center of the intersection for breaks in the oncoming traffic without blocking the straight-through traffic behind. It is believed by the engineers of the New Jersey highway department that the flared intersection with traffic control may approach the capacity of the four-leaf-clover type.

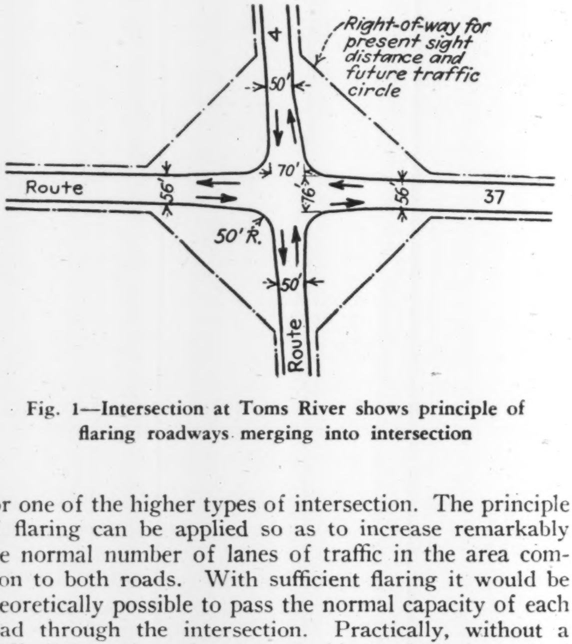

Right-of-way for present sight distance and future traffic circle
4
50'
70'
Route
56'
76'
56'
37
50'R.
50'
Route

Fig. 1—Intersection at Toms River shows principle of flaring roadways merging into intersection

Referring to Fig. 1, the characteristic flaring is rather restricted, but the general idea of widening the roadways as they merge into the intersection is plain. The indicated acquisition of extra right-of-way for present sight distance and a future circle is no particular characteristic for the flared intersection but may be a part of any intersection.

Primarily the flared intersection provides for the crossing of traffic streams with only secondary provision for diversion of traffic not passing through the intersec-

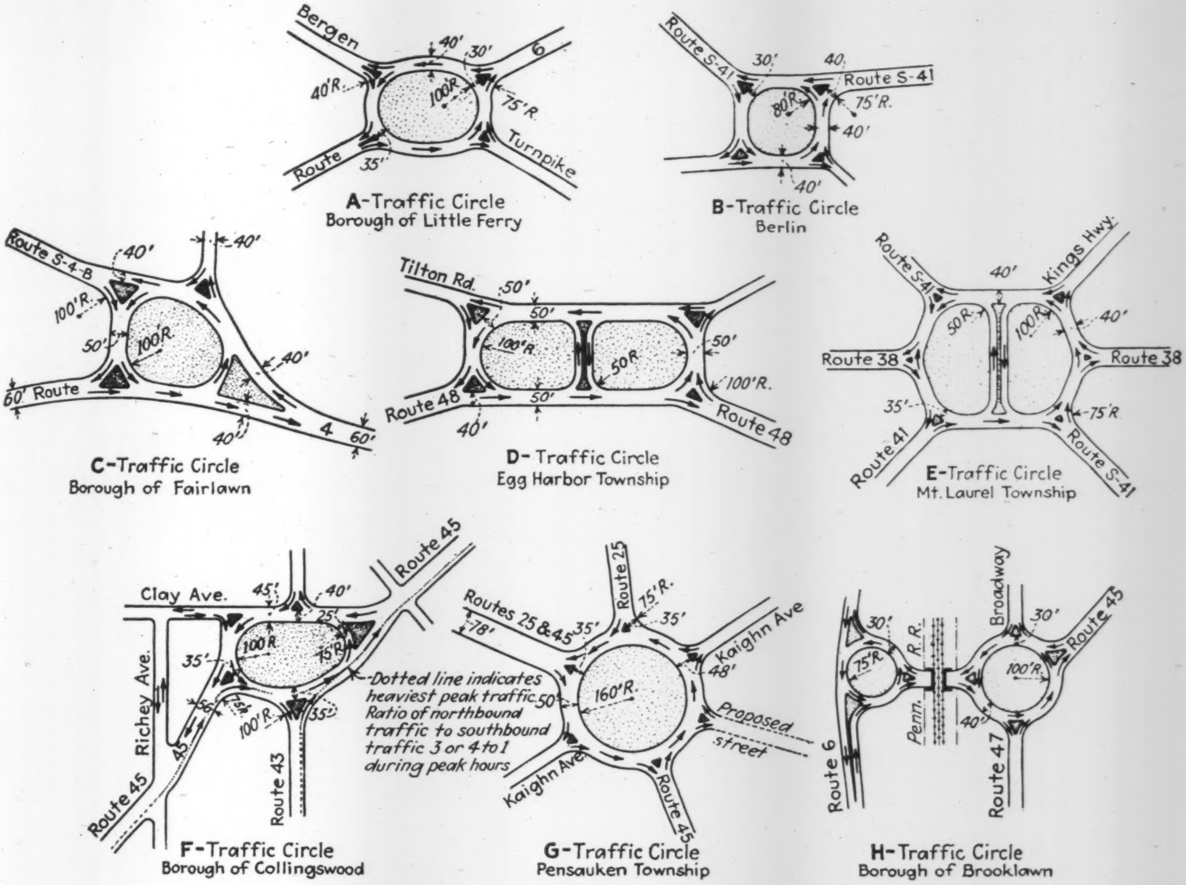

A-Traffic Circle
Borough of Little Ferry
Bergen
Route
6
Turnpike
40'
30'
40'R.
100'R.
75'R.
35'
B-Traffic Circle
Berlin
Route S-41
Route S-41
30'
40'
80'R.
75'R.
40'
40'
C-Traffic Circle
Borough of Fairlawn
Route S-4-B
40'
40'
100'R.
100'R.
50'
40'
60' Route
4
60'
40'
D-Traffic Circle
Egg Harbor Township
Tilton Rd.
50'
50'
100'R.
50'R.
50'
100'R.
50'
Route 48
Route 48
40'
E-Traffic Circle
Mt. Laurel Township
Route S-41
Kings Hwy.
40'
50'R.
100'R.
40'
Route 38
Route 38
35'
75'R.
Route 41
Route S-41
F-Traffic Circle
Borough of Collingswood
Clay Ave.
45'
40'
Route 45
25'
35'
100'R.
75'R.
Richey Ave.
75'R.
56'
100'R.
35'
45
Route 45
Route 43
Dotted line indicates heaviest peak traffic. Ratio of northbound traffic to southbound traffic 3 or 4 to 1 during peak hours
G-Traffic Circle
Pensauken Township
Routes 25 & 45
78'
35'
Route 25
75'R.
35'
Kaighn Ave
48'
50'
160'R.
Proposed street
Kaighn Ave
Route 45
H-Traffic Circle
Borough of Brooklawn
30'
R.R.
Broadway
30'
Route 45
75'R.
Penn.
100'R.
40'
Route 6
Route 47

Fig. 2—Examples of circles for distributing traffic between several intersecting roads

tion. Distribution of traffic is the essential function of the circle intersection, as shown by Fig. 2G. This is a notably perfect traffic circle constructed in 1926 near Camden, N. J. At this point six roads meet, each contributing traffic to the others but in varying amounts. The problem was to distribute traffic with the least possible crossing of other traffic, and this circle solves it. Few traffic circle intersections present as symmetrical arrangement, as is indicated by others of the group of circles shown in Fig. 2. The essential characteristics of all are: all traffic movements are at one grade; the majority of turns are with the traffic current; islands at road entrances separate entering and departing currents; traffic distribution is the primary function.

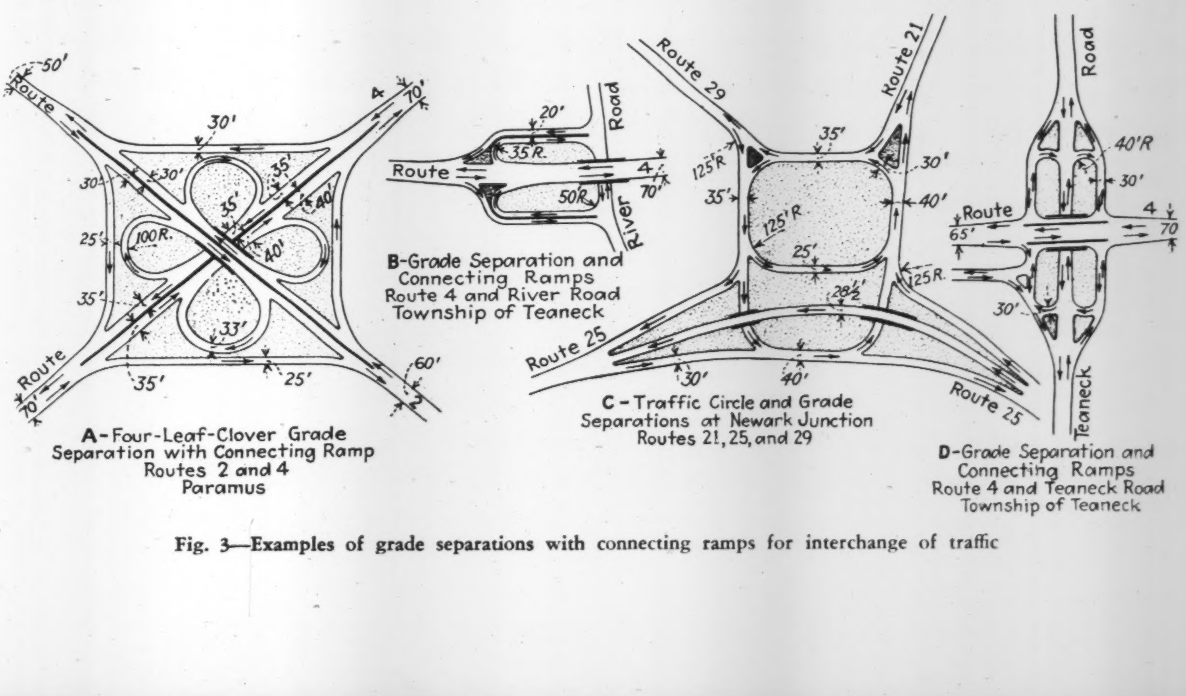

A-Four-Leaf-Clover Grade Separation with Connecting Ramp
Routes 2 and 4
Paramus
50'
Route
4
70'
30'
30'
30'
35'
40'
25'
100'R.
35'
40'
35'
33'
Route
70'
35'
25'
60'
2
B-Grade Separation and Connecting Ramps
Route 4 and River Road
Township of Teaneck
20'
35'R.
Road
Route
4
70'
50'R.
River
C-Traffic Circle and Grade Separations at Newark Junction
Routes 21, 25, and 29
Route 29
Route 21
125'R
35'
30'
35'
40'
125'R
25'
125'R.
28½'
Route 25
30'
40'
Route 25
D-Grade Separation and Connecting Ramps
Route 4 and Teaneck Road
Township of Teaneck
Road
40'R
30'
Route
4
65'
70
30'
Teaneck

Fig. 3—Examples of grade separations with connecting ramps for interchange of traffic

The most perfect device for passing two streams of traffic is the grade separation. By itself it provides no means to interchange traffic, so it is generally combined with a circle or interchange ramps. These may be quite constricted, as in the crossing shown by Fig. *3B*, built in 1930-31 in the township of Teaneck; or it may be more extended, as shown by the crossing (Fig. *3A*) constructed in 1930-31 at Paramus, N. J.; or at the intersection (Fig. *3C*) at Newark Junction. A functional distinction in the purpose of separation is shown by the last two examples. At Paramus the separation is the controlling element, and the ramps are supplementary; at Newark Junction the controlling elements are the circles and ramps, and the separations are merely contributing elements. At Teaneck the compact arrangements were dictated by high land costs and smaller volume of traffic. Fig. *3B* is in principle a clover-leaf crossing as truly as the more conventional example at Paramus or that at Woodbridge, which is fully described in a following section. The Paramus and Woodbridge intersections, with greater traffic and lower land costs, justified greater right-of-way acquisition to get the advantages of easier turns and consequently faster traffic movement. Incidentally, an unusual feature of the Teaneck ramps (Fig. *3B*) is that they are split into one-way roadways.

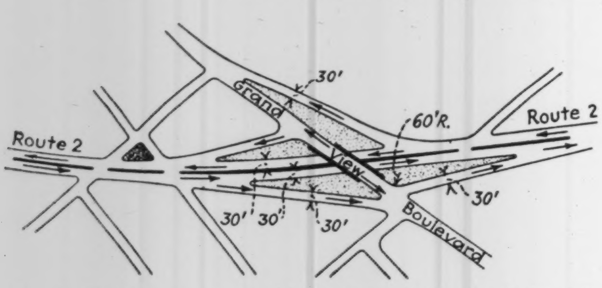


Fig. 4—Grade separation with one-way ramps requiring left turns across traffic

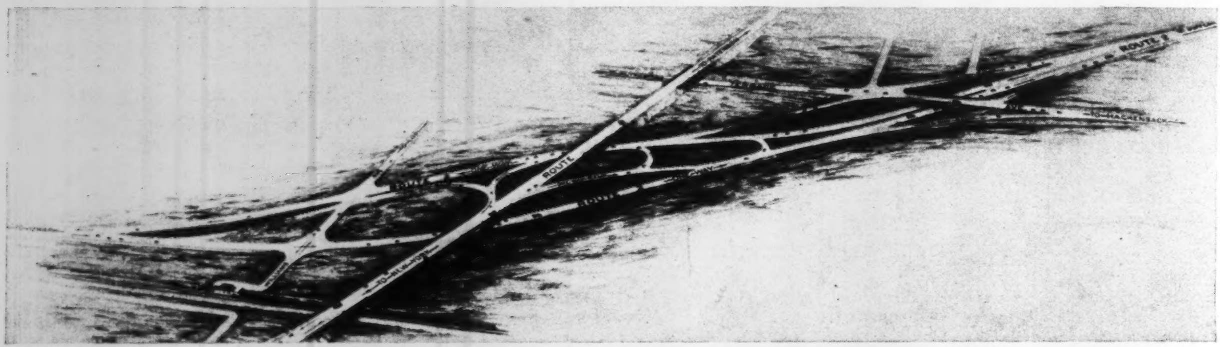


Fig. 5—Grade separation permitting direct left turns without cross-traffic

Allied to the clover leaves, but of distinct type from the viewpoint of traffic handling, are the intersections at Hackensack (Fig. 4) and at Hasbrouck Heights (Fig. 5). The Hackensack intersection is a type that is being employed extensively, especially where the traffic on one road is not sufficiently heavy to make it necessary to avoid cross-travel due to turning from one road to another. Comparing this intersection with the clover leaf (Fig. *3D*) at Teaneck, it will be seen that the ramps are one-way, and left-turn traffic crosses one line of straight traffic instead of going around the loop. The Hasbrouck Heights intersection (Fig. 5) is distinctive in type in that the left turns are made by a direct turn without cross-traffic rather than a reverse turn, as in a four-leaf-clover type. It is noted that no interchange is provided for traffic from Paterson on route 6, as this did not seem necessary. This intersection illustrates the influence on the design selected of topography, a railroad crossing and another separation in close proximity (that of Terrace Avenue).

The Woodbridge Cloverleaf

An outstanding development of New Jersey intersection practice has been the clover-leaf grade separation, a recent example of which is the intersection at Paramus (Fig. *3A*). As an example of the method of working out the plans of one of these intersections and also because it has become widely known, the Woodbridge clover leaf is described more in detail. Fig. 6 is an airplane view of this intersection.

Route 25 of the New Jersey state highway system extends from the Holland Tunnel, which joins New York with Jersey City, to the Delaware River bridge, which joins Philadelphia with Camden. In Woodbridge township the route crosses route 4, which is the main road from the metropolitan section of New York to the seashore resorts and carries 40,000 vehicles per day several days in the summer season. A separation in the grade of the two roadways was necessary to provide a free flow on both highways. Since there is a large amount of traffic turning from one route to the other, ramp connections were required. To prevent direct cross-traffic on the turns, the four-leaf-clover type of intersection was adopted.

The accompanying diagrams in Fig. 7 show the traffic flow for an average hour between 7 a.m. and 3 p.m. on July 4, 1930, through the intersection as built and as it would have been on the ordinary type of grade intersection. The total traffic entering the intersection for sixteen hours from 6 a.m. to 10 p.m. was 62,527, of which 77 per cent went straight through, 12 per cent turned left and 11 per cent turned right. On a grade intersection of the ordinary type it would have been necessary for 89 per cent of the traffic (44,778 vehicles) to have directly crossed the path of other vehicles, each vehicle crossing four other lines of traffic, giving a total of sixteen points of direct crossing.

The four-leaf-clover permits each main roadway to carry 100 per cent of its capacity through the intersection. The maximum capacity of both main roads operating over the ordinary type of intersection could not exceed the capacity of the greater of the two. Left turns

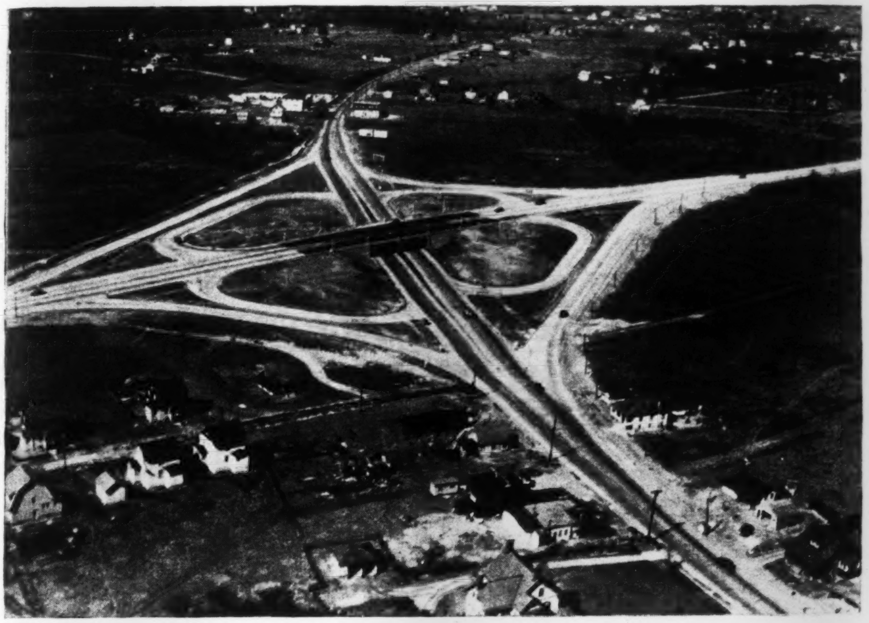


Fig. 6—Airplane view of conventional clover-leaf design at Woodbridge

would decrease this, so that it is probable that the total capacity of the intersection would be about one-third that of the clover leaf.

Each main roadway is divided by a center island extending beyond the ends of the ramps to prevent left turns. The left turn is accomplished by a three-quarter turn to the right in the form of a loop beyond the grade separation. This loop, or reverse turn, is an unnatural turn (contrary to one's sense of direction) and, therefore, confusing to motorists who have never seen it or who do not read the directions on the signs. This confusion was anticipated, and numerous signs were installed to direct traffic.

While there are no direct crossings at grade, it may be noted that traffic using the loops must cross other loop traffic in the distance between entering and leaving ramps—the crossing being with the flow of traffic. For instance, traffic from the north running east crosses the path of traffic from east turning south and of traffic from the west turning north. There are two crossings at grade for each line of loop traffic, or four crossings altogether. Since these are accomplished in some distance of travel and with the flow of traffic, no difficulty is experienced. They are the same type of crossing that are made on a traffic circle, but they are comparatively infrequent on the clover leaf.

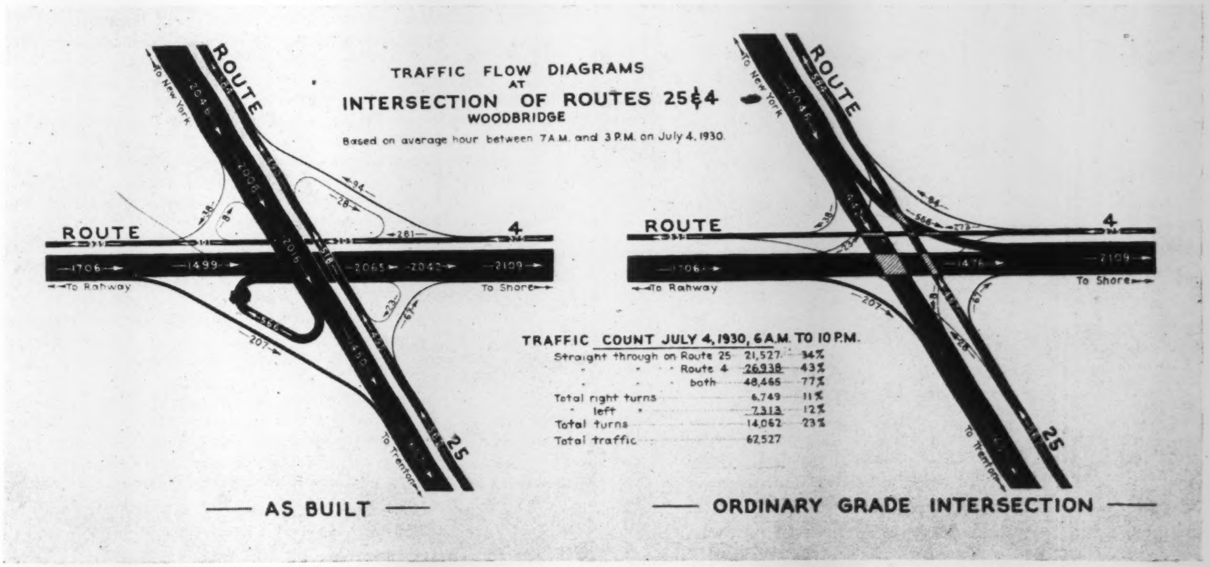
General Design Principles

Inspection of the intersections illustrated, which are only a few of many planned and constructed by the New Jersey highway department, positively demonstrates the previous statement that two intersections can rarely be planned exactly alike. It is in fact set down as the first principle of design that each intersection is a separate problem requiring an individual solution. The second principle is that present and future traffic should be analyzed to the best of one's ability and judgment. This analysis should be in such detail that the requirements of traffic, whether distribution, diversion, interchange or passage straight through, are known, and the relative volumes of each are indicated. This brings us to the third principle, which is that the plan should interpret and express the distinct purposes of the traffic.

Other Design Principles

Supplementary principles governing design of the intersection structure are:

1. Extra leeway for maneuvering should be provided



TRAFFIC FLOW DIAGRAMS AT INTERSECTION OF ROUTES 25 & 4 WOODBRIDGE

Based on average hour between 7 A.M. and 3 P.M. on July 4, 1930.

TRAFFIC COUNT JULY 4, 1930, 6 A.M. TO 10 P.M.

Straight through on Route 25	21,527	34%
" " " Route 4	26938	43%
" " " both	48,465	77%
Total right turns	6,749	11%
" left "	7,313	12%
Total turns	14,062	23%
Total traffic	62,527	

Fig. 7—Traffic-flow diagrams of Woodbridge clover leaf and straight intersection

at the point of meeting of traffic streams. The application of this principle is illustrated in about its simplest form by the flared intersections shown by Fig. 1. At the meeting point of traffic streams, flaring, widening and corner rounding provide an approximation to a plaza-like space for maneuvering.

2. All turns should be arranged to be in the direction of traffic. All of the intersections shown illustrate the exercise of this principle. Where there must be crossing of traffic streams it is arranged to be accomplished in some distance unless the traffic streams are light in volume.

3. The physical layout should tend to induce proper traffic direction. Examples of the application of this principle are shown by the use of islands and local widenings. By the skillful use of these devices traffic may be induced almost unconsciously to take proper routes in traversing the intersection. This principle is excellently illustrated by the diagram of the Fort Lee intersection shown in Fig. 8.

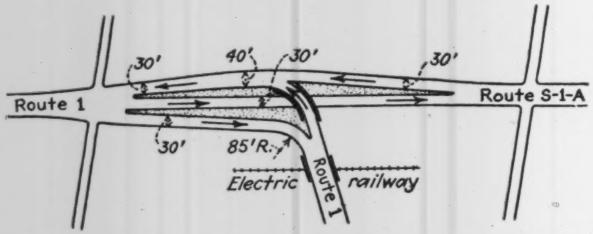


Fig. 8—Fort Lee intersection, illustrating layout to induce proper direction of traffic

4. Signs should plainly indicate the proper traffic movements and the intersection be lighted clearly so that these movements may not be hampered by poor visibility of road. Signs and their location and the lighting at intersections are necessary devices that present a puzzling problem. Experience has not yet settled on the best solution.

Practical Obstacles

Ideal design of intersections is seldom entirely unhampered. Design indicated by traffic requirements may easily be thrown out of consideration by the practical obstacles of topography or land costs or by mere lack of funds to build. Under the most favorable conditions any of the more complex intersections illustrated is a costly structure. Because of this fact, moreover, its design and construction may never be taken lightly. The investigation of convenience and necessity, the appraisal of values and costs, the comparison of plans and of structural designs call for as intelligent engineering as any task of civil engineering. At best, the rational design of intersections is only a very few years old, and much more experience is necessary for the working out of principles and practices.

Engineering Direction

The plans and practices considered here have been developed by the New Jersey state highway department, of which J. L. Bauer is state highway engineer, C. F. Bedwell construction engineer, and H. W. Giffin field engineer. This article has been prepared from field studies and information furnished from his files and experience by Mr. Giffin.

Steel Lining of Pressure Tunnels at Hoover Dam Recommended

RECOMMENDATIONS of the Colorado River Board to the secretary of the interior in relation to the spillways and the spillway and pressure tunnels at Hoover Dam were abstracted briefly in our news pages last week. In reference to the spillways, the board, after observing the tests of spillway models at Montrose and Fort Collins, Colo., and of the model of the dam at Boulder, Colo., approved the general designs of the spillways but asked for further study to determine the best type of curves in the spillway tunnels before making a final recommendation.

In commenting on the lining of the spillway tunnels the board said:

> Each of the proposed spillways has a maximum discharge capacity of 200,000 sec.-ft., which involves a velocity in the tunnels approaching 180 ft. per second. With these conditions in mind, the board desires to emphasize the obvious fact that the safety of the spillway tunnels will depend on the integrity of the lining, especially in its competence to withstand the erosive and plucking action of water at the unprecedented high velocities involved (approximately double that of previous engineering experience). Every effort should therefore be made to secure the best possible quality of concrete, finish of surface and union with the rock walls. Structures that are to be operated under and subjected to such conditions require extraordinary and unprecedented care and the most carefully selected and best possible materials and methods of construction. The normally sound rock walls will inevitably be considerably shattered by blasting in the course of excavation, and these cracks, as well as the natural joints of the surrounding rock, should be filled as perfectly as possible. The major objective should be to secure essentially a monolithic condition, which calls for thorough grouting of voids over the arch of the tunnel and seams in the surrounding rock.

The preliminary plan called for concrete lining for the main tunnels that convey the water, under pressure, from the reservoir to the penstocks leading to the power houses, and to the outlet works. Concerning these tunnels the board said:

> These tunnels will be subjected to full pressure head of the reservoir, and consequently all considerations must be based on pressures obtaining when the reservoir is full, which amounts to a head of water of about 560 ft., or 240 lb. per sq.in. In addition to this static-head pressure, the tunnels will be subjected to an impact or surge pressure whenever the moving mass of water is suddenly retarded by the gates at the power house.
>
> It is imperative that leakage of water from these tunnels into seams or other openings in the surrounding rock be prevented, not only to insure against waste of water but to guard against the tremendous disruptive stresses that would be set up in the rocks of the canyon walls if leakage water accumulated in the joints, fissures or fractures. Above the dam these stresses will be balanced by the pressure of the water in the reservoir and could do no damage. Below the dam they would have only the resistance of the rock between the tunnels and the canyon. Leakage from the pressure tunnels might subject the rock between the faces of the canyon and the pressure tunnels to stresses as great as those imposed upon the dam itself by the water in the reservoir. Obviously the possibility of such stresses in the canyon walls below the dam must be eliminated by preventing leakage of pressure water from the tunnels.
>
> Concrete lining is inadequate for this purpose at the pressures involved. It is the opinion of the board that steel plate should be used as a container of the water in the pressure tunnels below the reservoir. Provision should obviously be made for drainage of any leakage water that may escape througn the tunnel lining, in order to prevent its accumulation under pressure in the rock openings.

The Colorado River Board consists of Major Gen. William L. Sibert, Charles P. Berkey, Daniel W. Mead, Warren J. Mead and Robert Ridgway.

Residences of Welded Steel Construction

Steel Frames for house construction have been discussed more actively and used more widely in the last two or three years than at any time since they were first proposed. Bolted and riveted construction has been common, but until recently no steel-frame residence has been entirely welded. The following articles describe two of the first completely arc-welded steel houses. Both houses were built during the first half of this year, and each utilizes distinctive design details. Structural steel is used for the frames of these houses, but pressed-steel sections have been used elsewhere. It is reported that the Cleveland house described below proved so successful that the architect has three similar structures under construction. —Editor.

Residence With Welded Frame of Standard Structural Shapes

By A. F. DAVIS
Lincoln Electric Co., Cleveland, Ohio

A THREE-STORY steel-frame residence involving completely arc-welded construction was recently completed in the Shaker Heights district of Cleveland, Ohio. Joists and studding are of standard structural shapes. Walls are of masonry—an outside 4-in. brick shell and an inside shell of hollow tile 2 in. thick, with a 3-in. dead-air space between. About 10 tons of structural steel was required. The architect's estimate of cost for the residence was practically the same whether a wood or a steel frame was used. In fact, the dwelling was originally designed for either wood or welded-steel construction, and estimates were received from all trades for both types of construction, as shown in the accompanying table. The contract was awarded for arc-welded steel construction at the same price as was asked for wood constructon.

The steel was delivered to the site from the warehouse, cut to length only, all fabrication being done on the job.

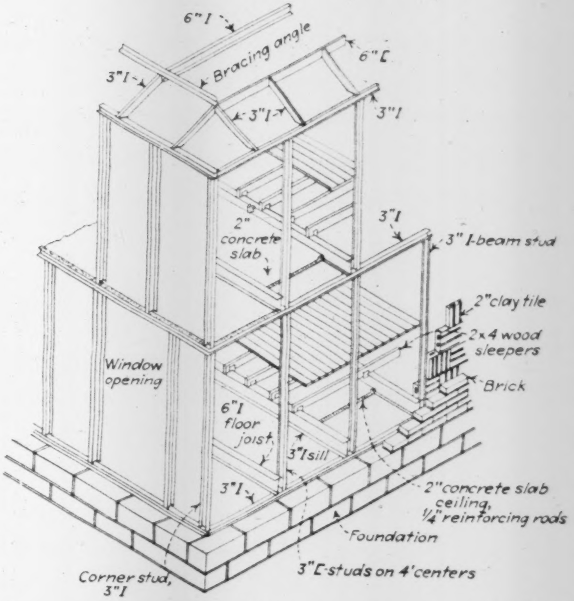


Fig. 1—Erection diagram of welded steel-frame house, Cleveland

Two structural-iron workers and one welding operator fabricated and erected about 3 tons of steel the first working day.

The steel framework of the house includes 3-in., 5.7-lb. I-beam sills, 3-in., 4.1-lb. channel studs, 6-in., 12.5-lb. I-beam joists for first and second floors, and 6-in., 8.2-lb. channel joists for the third floor. Basement framing, where required, consists of 8-in., 18.4-lb. I-beams resting on 4-in. I-section columns, the beam-to-column connection being made by fillet welds between the column flange faces and the bottom flanges of the beams.

The first-floor sills are laid directly upon the founda-

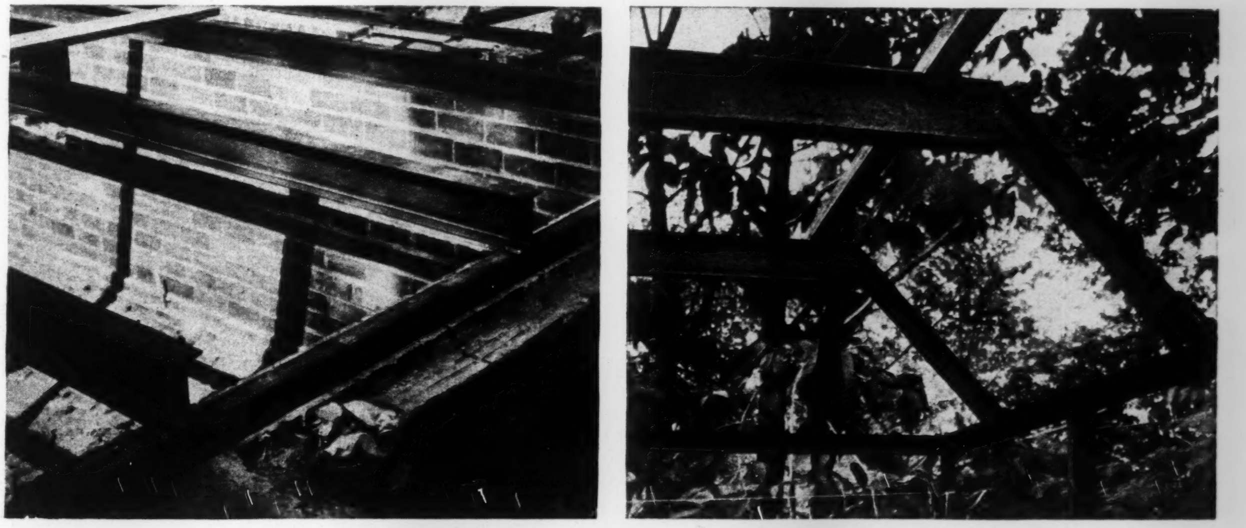


Fig. 2—Field joints in the Cleveland house were easily made by welding, as in the first-floor joist connection to the sill (left view) or in the more complicated third-floor framing (right view)

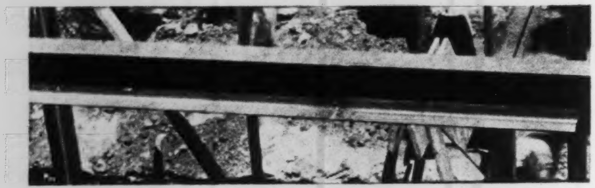


Fig. 3—Second-floor joists of Cleveland house are spliced with a simple butt weld

tion walls. Floor joists on 4-ft. centers are secured to the sills and the basement beams by 2-in. tack welds along either side of the joist flanges. Corner studs are 3-in., 5.7-lb. I-sections. All other studs are 3-in. channels, welded directly to the first-floor sills on approximately 4-ft. centers. These studs are topped with 3-in., 5.7-lb. I-beams, which serve as second-floor sills. To insure extra stiffness, angles are welded between the corner studs and the sills. The first-floor partitions also utilize 3-in. channel studs on 4-ft. centers.

The second-floor framing is similar to that used in the first story, except where special architectural considerations made framing changes necessary. For instance, at the second-floor rear elevation there is an offset of about 5 ft. in from the rear wall. Some of the studding in this wall is not placed directly over the second-floor joists and a 3-in. I-beam sill had to be inserted to carry the load. The masonry for the second-story rear wall is carried by 3x2x¼-in. angles spanning the second-floor joists, one angle on each side of the studs.

A steep-pitch roof is an architectural characteristic of the house. Thus the area of the third floor is considerably smaller than that of the first and second floors. So that the third-floor joists could be supported by the framework of the exterior wall, they are carried by 3-in. I-beams sloped down to the sill beams in the ceiling of the second floor. The splice connection between the 3-in. I's and the 6-in. I-beam floor joists is shown in Fig. 2. This is one of the two welded connections in the residence in which the weld is in shear. The other shear weld occurs where a direct butt-joint splice is made in some second-floor joists. Lateral bracing is provided by an angle welded across the top of the third-floor joists.

Framing and wall details are shown in Fig. 1. The masonry is tied to the steel by means of clips. Ceilings are of poured concrete, and 2x4-in. timbers set on end and spanning the floor joists form the framing to which the wood subfloor and finish floor are applied. This floor system permits wiring and plumbing in either direction without cutting the steel framework.

COMPARATIVE COST ESTIMATE OF STEEL- AND WOOD-FRAME CONSTRUCTION

Contract	Brick-Veneer Frame Construction	Brick-Veneer Steel Construction
Excavating, rough grading	$315.00	$315.00
Finish grading, lawn and drive	235.00	235.00
Masonry — cement, iron, walks, stone	2,820.00	3,395.50
Structural steel	180.00	881.50
Steel — sash and screens	404.00	404.00
Carpenter labor	1,400.00	1,000.00
Rough lumber	1,185.00	432.00
Finish lumber	1,025.00	1,025.00
Floor scraping	80.00	80.00
Plastering	800.00	615.00
Wiring	335.00	420.00
Tinning	285.00	285.00
Painting	520.00	520.00
Plumbing	1,275.00	1,275.00
Heating	850.00	850.00
Ornamental iron	150.00	150.00
Tile	361.00	361.00
Mantels	40.00	40.00
Weatherstripping	28.00	28.00
Calking	25.00	25.00
Garage doors	100.00	100.00
Cabinets	35.00	35.00
Composition roof	60.00	60.00
	$12,508.00	$12,532.00

Administration—This arc-welded steel-frame residence was designed by George Howard Burrows, architect, Cleveland, and erected by the McKay Building Co., Cleveland. Louis K. Whitcomb, Jr., structural engineer, of the Carnegie Steel Co., checked the steel design and served as inspector of the fabrication and erection.

* * *

Welded Steel House Utilizes Shop-Fabricated Frame

By **B. S. HAVENS**
General Electric Co., Schenectady, N. Y.

A BRICK and steel dwelling in which the frame was fabricated and erected by electric arc-welding was completed in Larchmont Gardens, New York, in the spring of 1931.* It is a six-room, two-story building, 32 ft. by 26 ft., with full basement and a two-car basement garage, and is built on a foundation of stone and concrete. The entire framework and all interior partitions are made up of standard-size panel frames, previously fabricated in the welding shop from 1½-in. angles. Two duplicate frames tied together with spacers provide the regular wall thickness of 4 in. throughout the house. Two sizes of panels are used—windowless sections 2 x 9 ft. and sections including windows 6 x 9 ft.

In erecting the walls and partitions, a ¼-in. plate sill 6 in. wide was laid directly on the foundation to take care of any roughness on the concrete, and was fastened down by means of bolts grouted in the concrete. The fabricated panels were then welded to the sill. Adjoining panels were welded together at their edges to make a solid structure throughout. The second floor was erected in exactly the same manner and was welded to the top of the first floor sections.

An 8-in. I-beam is used for the main-floor bearing beam. Steel-truss floor joists 8 in. deep are used on both the first and second floors and are welded to the frame of the house at each end and to the bearing beam or partitions in the middle. This type of floor joist was used because it provides rigidity without excess material. A 2-in. wire mesh interwoven into fire-resistant waterproof paper is laid directly over the floor joists and covered with 2 in. of concrete to make up the floor.

The rafters are 4-in. channels on 2-ft. spacing and are welded directly into the outside wall framework of the building. The gable sections were fabricated in the shop, trucked to the building site, hoisted into place and welded. The roof covering consists of the 2-in. wire mesh and waterproof paper material covered with a 2-in. layer of a concrete asbestos composition and slate shingles.

The outside of the house is finished with brick. The gables and dormer are finished with stucco. Steel casement windows are welded into the framework of the building, as are steel stairways. Steel doors, set in steel frames welded into place, are used.

The interior finish of the house consists of the wire mesh and paper fabric placed over the framework and plastered.

**Journal* of American Welding Society, June, 1931.

Designing the First Freyssinet Arch to Be Built in the United States

As the First concrete-arch bridge to be built in this country by the Freyssinet method, the Rogue River bridge assumes an importance unusual in the ordinary run of concrete-arch design. Those most familiar with the present project are of the opinion that many concrete arches and some of unprecedented span will result directly from the introduction of this method into this country. Previous technical material on this type of design and construction has consisted of outlines of the original French procedure or generalization on the theory involved. The present article provides a description of the design methods and analysis of stress economy for the first concerte-arch span to be built in the United States by this method. Subsequently, the decentering and adjustment operations and the results of the extensive research study in stress distribution will be reported by the authors. —Editor.

By CONDE B. McCULLOUGH
Bridge Engineer, Oregon State Highway Department,

and ALBIN L. GEMENY
Senior Structural Engineer, Division of Tests,
U. S. Bureau of Public Roads

The first bridge to be built in this country using the Freyssinet method of concrete-arch construction is nearing completion at the mouth of the Rogue River in southwestern Oregon. A project of the Oregon state highway commission, the half-million-dollar structure will replace a state-owned-and-operated ferry at the same location and form an important link in the Roosevelt Highway along the Pacific Coast. Interest in the design features of the seven 230-ft. open-spandrel-type arches centers on the adoption of the Freyssinet system of arch decentering by the use of crown jacks and the subsequent stress adjustment. Steps in the design procedure and comparison of the resulting structural elements with those derived by ordinary arch design are described in the following.

The seven-span river channel crossing is flanked at either end by 144 ft. of reinforced-concrete viaduct, making the entire structure 1,938 ft. long. Roadway width is 27 ft., and there is a 3½-ft. pedestrian way of cantilever construction on either side. Arch ribs have a 230-ft. span with a 47-ft. rise and are 7 ft. 8 in. thick at the springing line and 2 ft. 9½ in. at the crown. The rib width of 6 ft. resulted directly from use of the Freyssinet method and is referred to in detail later. Foundations for the six river piers consist of timber piles in sand and gravel. Two of these are abutment piers on batter piles dividing the arches into a three-span center group flanked by two spans on either side. Principal features of the structure were noted in *Engineering News-Record,* Aug. 21, 1930, p. 290.

Principle Outlined—Previously described from time to time in technical publications (an early reference being *Engineering News-Record,* Sept. 18, 1924, p. 463), the principle involved in the Freyssinet method of arch construction, named after the eminent French bridge engineer E. Freyssinet, is assumed to be understood in general. Very briefly it can be explained by tracing the effects subsequent to the usual decentering operations for a concrete-arch ring. Such an arch, resting on its centering, is under no load and, with the exception of local shrinkage stresses, is also under no stress. If the centering is released, loads will be transferred from the falsework to the arch rib, which will support the loads, in a large measure, by axial thrust, provided the axial curve of the arch has been properly designed. This axial thrust, however, induces an elastic shortening of the rib, with the result that the span is forced to assume a shorter curve. A decrease in temperature, a shrinkage of the concrete or any slight displacement of the supports operates in a similar manner, forcing the arch to a still lower position. This change in curvature of the arch ribs obviously sets up bending stresses, which have been termed deformation stresses as distinguished from the load stresses and which, while contributing nothing to the load-carrying capacity of the span, are nevertheless inevitably present as a result of the ordinary method of decentering.

If, however, the arch, while resting on the falsework, was severed at the crown and a system of hydraulic jacks introduced, it would be possible to lengthen the rib an amount equal to the calculated shortening produced by dead load, temperature, shrinkage, plastic displacement of supports and other causes, so that the arch could take load without settlement or flexure. Such, in brief, is the theory underlying the Freyssinet system of decentering.

Once the feasibility of controlling internal stresses was demonstrated, it became apparent that other stresses besides merely compensating ones might be introduced. The analysis of any arch will disclose the fact that, aside from the deformation stresses mentioned above, there is a certain amount of bending stress introduced under dead load even with the most carefully selected axial curve. This is due, among other causes, to the fact that the rib sections between the points of load concentration act as curved columns. When these dead-load bending stresses are evaluated, it is possible to determine by trial the particular crown thrust and moment that will produce the most advantageous stress distribution throughout the rib (all conditions of loading considered) and to introduce arbitrarily such predetermined stresses into the crown by means of the hydraulic jacks and subsequently key the rib to this exact position.

Design Procedure—The entire design operation using the Freyssinet principle can be outlined in two steps as follows:

1. Lay out the arch in the ordinary manner and compute live load, impact, temperature and shrinkage stresses (group *A,* Table I, p. 843) the same as for any fixed arch. The live-load and impact requirements are determined, of course, by the specification under which the design is being developed. The seasonal temperature variation is the maximum variation each way from the temperature which is assumed to obtain at the time of keying the arch. The shrinkage stresses are determined

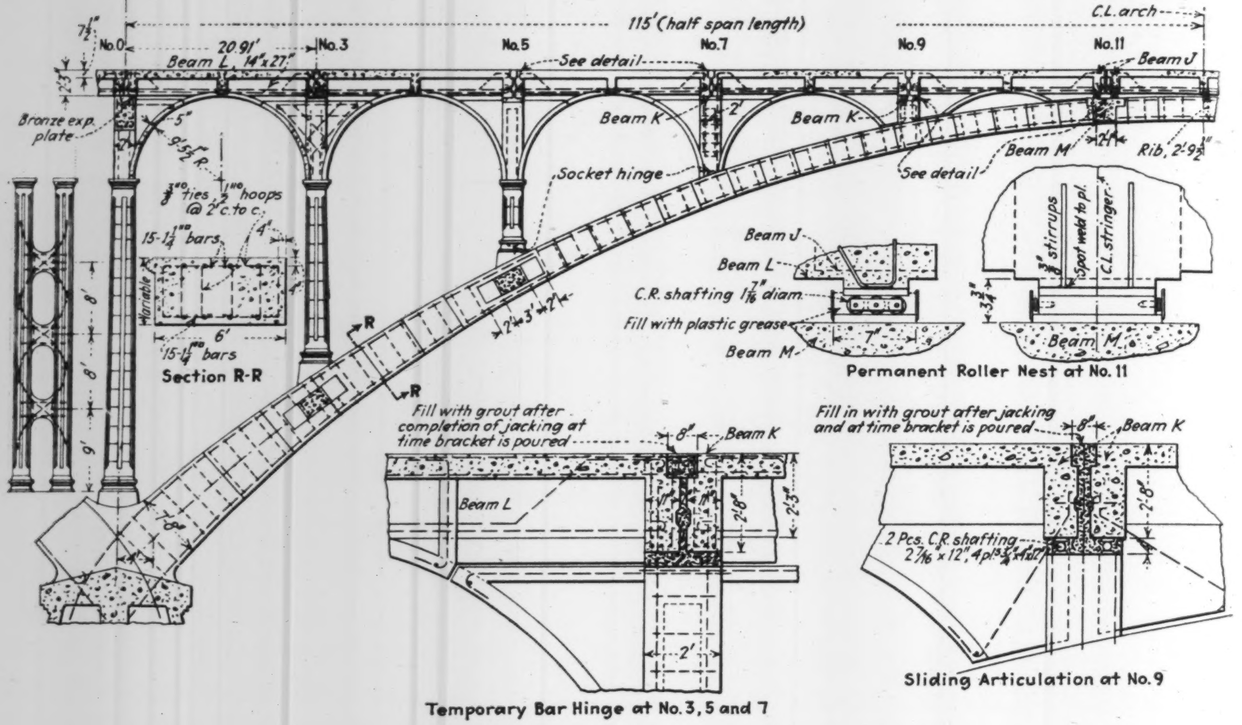

115' (half span length)
C.L. arch
No.0
No.3
No.5
No.7
No.9
No.11
20.91'
Beam L, 14"x27"
See detail
Beam J
Bronze exp. plate
Beam K
Beam K
Beam M
Rib, 2'-9½"
Socket hinge
See detail
3/8" ties, 3/8" hoops @ 2" c. to c.
15-1¼" bars
15-1¼" bars
6'
Variable
8'
8'
9'
Section R-R
R
R
2'
3'
2'
7'-8"
Beam J
Beam L
C.R. shafting 1 7/16" diam.
Fill with plastic grease
7'
Beam M
3/8" stirrups
Spot weld to pl.
C.L. stringer
Beam M
Permanent Roller Nest at No. 11
Fill with grout after completion of jacking at time bracket is poured
8"
Beam K
Beam L
2'-8"
2'-3"
2'
Temporary Bar Hinge at No. 3, 5 and 7
Fill in with grout after jacking and at time bracket is poured
8"
Beam K
2 Pcs. C.R. shafting 2 7/16" x 12"
2'-8"
Sliding Articulation at No. 9

Fig. 1—Half section of arch with details of superstructure articulation

from a coefficient that represents such shrinkage as may be assumed to occur subsequent to keying operations. This residual shrinkage will depend upon the age of the concrete at the time of keying, the mix, gradation of aggregates and other factors. In the case of the Rogue River bridge, a residual shrinkage coefficient of 0.00025 was employed for design purposes. The seasonal temperature variation was assumed to be a 30-deg. rise and a 20-deg. drop from the estimated keying temperature of 50 deg. F. This seasonal temperature range is small, but it is considered ample for local climatic conditions. Gold Beach is situated on the coast at the extreme mouth of Rogue River, where the mean annual temperature variation does not exceed 50 deg. F. and the air temperature never drops below freezing.

2. Having calculated group *A* stresses, the dead load of the arch is next computed, and the compensating or adjusting stresses to be introduced by the hydraulic jacks are calculated from the formulas given in Fig. 2, exactly as in the case of any cantilever loaded with an eccentric terminal thrust. By varying *H* (the total jacking pressure) and *h* (which is a function of the eccentricity of this jacking pressure) unit stresses for the adjustment procedure (group *B*, Table I) may be varied through a wide range. The last phase of the design is simply the determination, by trial, of those values of *H* and *h* which, in combination with group *A* stresses, will produce the most satisfactory stress distribution throughout the rib.

Stress Analysis—The unit stresses at both intrados and extrados of the Rogue River arch for crown, skewback and two intermediate points are shown in Table I, for all conditions of loading. An inspection and analysis of this table is perhaps the best method of indicating the detailed method of design and its inherent economic advantage.

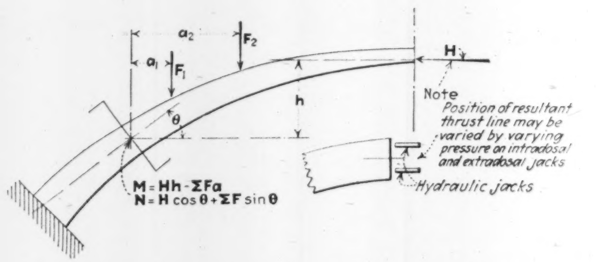

a₂
F₂
a₁
F₁
H
h
θ
M = Hh - ΣFa
N = H cos θ + ΣF sin θ
Note
Position of resultant thrust line may be varied by varying pressure on intradosal and extradosal jacks
Hydraulic jacks

Fig. 2—Moment and thrust formulas for jacking pressure

Stresses listed under group *G* are included for comparison and need not be calculated when using the Freyssinet system. They are stresses occurring in an ordinary fixed arch and are of interest in making a comparison between the two types of design.

Values of *H* and *h* which produce the most advantageous adjustment depend upon the temperature obtaining at the time of keying and the residual shrinkage of the material. If keying operations are performed at a temperature different from the original assumed mean or if for any reason it is believed that the shrinkage that will take place subsequent to keying may vary from that originally assumed, the group *A* stresses will be modified, and the compensating or jacking forces must be changed accordingly.

In the Rogue River bridge, charts have been prepared indicating the variation in jacking pressures necessary for each degree of temperature variation from the assumed mean and also for residual shrinkage coefficients varying from that first assumed (0.00025). At the time of final adjustment the jacking forces will be varied in accordance with observed temperature conditions and with measurements made on the shrinkage of concrete blocks of the same age as the rib concrete at the time of final keying.

Among the stresses listed in group *C* are those that result from hydration temperatures in the concrete. These are generally of considerable magnitude but may be in part eliminated by leaving keyways in the arch rib even with the ordinary method of construction, so that the propriety of using them as a basis of comparison may be open to some question. As a matter of general interest, the heat of hydration in one of the arches of the Rogue River bridge produced a rise, from a placement temperature of 65 deg. F., to a maximum of 140 deg. in about 40 hours, and remained above 100 deg. for 110 hours after placement. This hydration temperature is somewhat greater than those generally observed in other structures and is probably accounted for by the extraordinarily rich character of the mix.

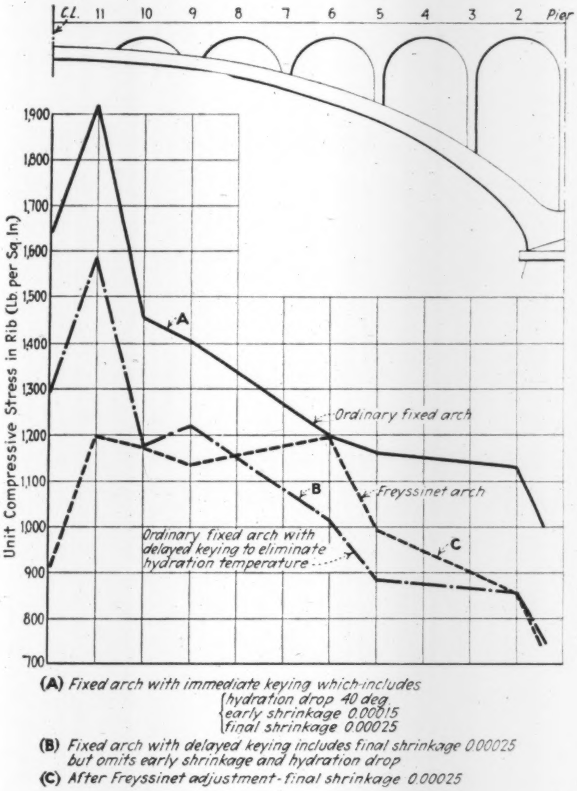


Fig. 3—Rib stress by Freyssinet adjustment compared with fixed-arch methods

Design Comparison—Direct results of the Freyssinet adjustment in terms of reduction in unit stress are shown in Fig. 3. The decrease in maximum unit stress in the concrete from 1,584 lb. per sq.in. for a fixed arch with delayed keying, to 1,194 lb. by means of the jacking operations does not include any effect of hydration temperature for the former type of design. If hydration temperatures are considered (curve *A*), the stress reduction is much more pronounced.

The authors' opinion is that the Freyssinet system appears to be the most feasible method by which this notable stress reduction could have been effected without material increase in concrete yardage. For example, if the thickness of the arch rib was increased, the live-load and a portion of the dead-load stresses could be reduced, but the deformation stresses (temperature, shrinkage, elastic rib shortening, etc.), would be correspondingly increased, so that no stress relief could be obtained from this procedure. If, on the other hand, the rib was widened, the deformation stresses would remain constant, and the only stress relief possible would result from a proportionate reduction in live-load and impact stress and a reduction in the dead-load stresses caused by the arch superstructure. The rate at which this method of stress relief could be effected was found to be discouragingly slow. The calculations indicated that to reduce unit stresses from 1,584 lb. per sq.in. (the maximum stress near the crown, even neglecting hydration temperatures) to 1,194 lb. (the stress obtained by the Freyssinet adjustment) it would be necessary to increase the width of each rib from 6 to 10 ft. This would result in a concrete yardage increase of 2,050 cu.yd. and a proportionate increase in reinforcing which, at the unit prices bid, would have increased the cost of the structure $59,450.

Provisions for Jacking—A battery of eight 275-ton hydraulic jacks is provided at the crown of each span, the equipment available being sufficient for the simul-

TABLE I — RIB STRESSES BY FREYSSINET METHOD COMPARED WITH THOSE COMPUTED FOR ORDINARY FIXED ARCH
(Fig. 1 indicates position of points 9 and 5.)

	Crown				Point No. 9				Point No. 5				Skew Back			
	Intrados		Extrados		Intrados		Extrados		Intrados		Extrados		Intrados		Extrados	
	Comp.	Tens.	Comp.	Tens.	Comp.	Tens.	Comp.	Tens.	Comp.	Tens.	Comp.	Tens.	Comp.	Tens.	Comp.	Tens.
Group *A* (post adjustment stresses)																
(*a*) Live load and impact	272	285	375	170	452	469	575	356	283	182	238	169	260	301	345	220
(*b*) Temp. rise 30 deg.	189	.....	.....	165	111	.....	.....	89	.....	129	145	.....	.....	117	123	.....
(*c*) Temp. drop 20 deg.	.....	125	111	.....	.....	73	59	.....	87	.....	.....	97	78	.....	.....	82
(*d*) Shrinkage (assumed coeff. = 0.00025)	—241	241	213	—213	—142	142	114	—114	166	—166	—186	186	150	—150	—158	158
Total — group *A*	220	651	699	122	421	684	748	331	536	145	197	452	488	268	310	460
Group *B* (Freyssinet adjustment)																
Total *Fa* (see Fig. 2)	.....	.....	.....	.....	2607	—2607	—2563	2563	8687	—8687	—8501	8501	5450	—5450	—5242	5242
Hh (*H* applied 0.20 ft. below axis)	634	—634	192	—192	—1894	1894	2678	—2678	—8230	8230	8788	—8788	—5206	5206	5420	—5420
Total — group *B*	634	—634	192	—192	713	—713	115	—115	457	—457	287	—287	244	—244	178	—178
Group *C* (fixed-arch stresses for comparison)																
(*e*) Dead load	319	—319	507	—507	418	—418	430	—430	288	—288	456	—456	202	—202	218	—218
(*f*) Rib shortening due to dead load	—88	88	78	—78	—51	51	41	—41	60	—60	—68	68	55	—55	—57	57
(*g*) Add'l temperature due to hydration	—250	250	222	—222	—146	146	118	—118	174	—174	—194	194	156	—156	—164	164
(*h*) Shrinkage (assumed coeff. 0.00015)	—144	144	128	—128	—84	84	68	—68	100	—100	—112	112	92	—92	—94	94
Total — group *C*	—163	163	935	935	137	—137	657	—657	622	—622	82	—82	505	—505	—97	97
Total — groups *A* and *B*	854	17	891	—70	1134	—29	863	216	993	—312	484	165	732	24	488	282
Total — groups *A* and *C*	57	814	1634	—813	558	547	1405	—326	1158	—477	279	370	993	—237	213	557

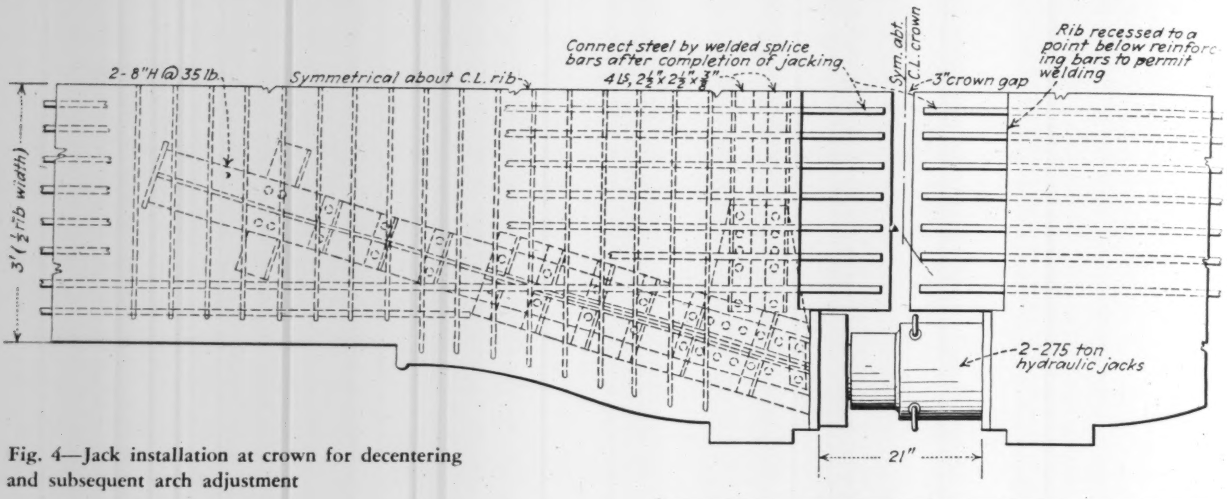

2-8"H @ 35 lb.
Symmetrical about C.L. rib
Connect steel by welded splice bars after completion of jacking
4 Ls, 2½"x2½"x⅜"
Sym. abt. C.L. crown
3" crown gap
Rib recessed to a point below reinforcing bars to permit welding
3'(½ rib width)
2-275 ton hydraulic jacks
21"

Fig. 4—Jack installation at crown for decentering and subsequent arch adjustment

taneous adjustment of two spans. The four extradosal jacks (two for each rib) are connected to one pump system, and the four intradosal jacks are on another pump system. This permits any predetermined thrust and bending moment, within the range of the equipment, to be placed in the crown of each span. Specially designed structural-steel emplacements (Fig. 4) transfer the thrust into the arch rib. Rib reinforcing, of course, is stopped at the crown, leaving a 3-in. gap, and the concrete is recessed to expose 1 ft. of the bars on each side to permit welded splice-bar connections after the adjustment by jacking has been completed.

In addition to the individual arch adjustment, the present multi-span structure will involve problems of transferring jacking thrusts from one span to another through intermediate piers.

Superstructure Influence—One of the most interesting design problems was an investigation of the effect of the rigidly connected spandrel structure. The arrangement of columns, expansion joints and articulation finally adopted is shown in Fig. 1. Study of the problem indicated that three factors would control these design features: (1) effect of rigidly connected superstructure on arch stresses of group *A*; (2) effect of such a superstructure on adjustment stresses; and (3) stresses developed in the spandrel structure itself.

The rigidly connected spandrel structure exerted a marked stiffening effect on the arch rib under analysis but transferred a considerable amount of load from adjacent spans, as would be logically expected. With a completely articulated spandrel system, the load transference from one span to another in the present structure would be small because the pier rigidity is relatively high. A continuous superstructure, however, produces a stress path from one span to another many times more rigid, so that interspan effects are quite pronounced.

Regardless of the increase in interspan load transference due to superstructure continuity, the desirability of eliminating expansion joints would doubtless have dictated the adoption of a continuous superstructure for at least two and perhaps three spans, except for the pronounced overstresses developed in the superstructure itself under such conditions of continuity. Analysis for temperature stresses completely eliminated consideration of a three-span continuous unit and, even with an expansion joint over each pier, one of the spandrel columns indicated a temperature stress above the ultimate strength of the material. These studies and also the desirability of eliminating completely superstructure effects during decentering and adjustment dictated the adoption of a system of articulation and expansion joints the general location and details of which are indicated in Fig. 1.

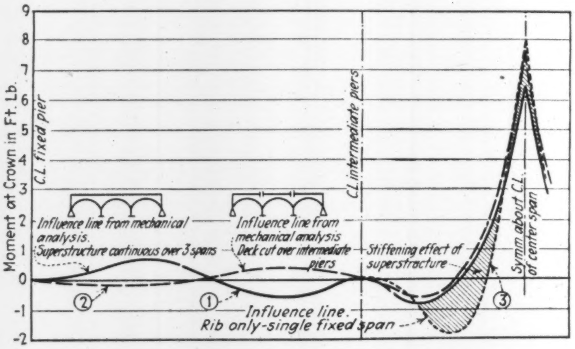


Fig. 5—Superstructure continuity effect, showing load transference

It will be noted that columns Nos. 0 and 3 in each span are fixed at the bottom, being comparatively long and flexible. Columns Nos. 5 and 7 are articulated at the base by means of a socket hinge. The deck is completely severed at column No. 0, and the deck stringers are separated from the floor beams at this point by means of sliding bronze expansion plates to form a permanent expansion joint in the deck for each span. At the tops of columns Nos. 3, 5, 7 and 9 a temporary articulation is effected in the floor beam *K*. These articulations are solely for the purpose of eliminating, during the operation of decentering, any bending stresses which might be introduced into the arch ring through the stiffness of a continuous floor system. While this rigidity is unobjectionable after the arch has been adjusted and keyed, it introduces an element of uncertainty during the operation of decentering and adjustment. These articulated floor segments will be rendered monolithic later by filling with grout after the completion of the jacking operations.

In addition to this articulation, it was necessary to support the beams on column No. 9 in each span on temporary roller bearings to rid the arch of restraint during the operation of decentering. This roller bearing will be converted into a monolithic rigid joint by grouting after the arch is adjusted and keyed. The floor system at beam *M* (either side of the crown) is supported by means of a system of permanent roller bearings. At one of these beams the floor is completely severed, while the other beam utilizes a dummy joint in the deck.

As a result, the number of permanent expansion joints in the deck is reduced to one per span and one over each pier, while the temporary articulations serve to remove all superstructure restraint during the operation of decentering and to render all column loads truly vertical.

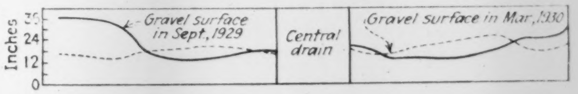
Organization—The Rogue River bridge is being built by the Oregon state highway commission and the United States Bureau of Public Roads. The project is under the general direction of Roy A. Klein, state highway engineer, and William Lynch, district engineer for the Bureau of Public Roads. The design was prepared under the direction of O. A. Chase, chief designing engineer for the Oregon bridge department, and the construction work is under the general supervision of G. S. Paxson, assistant bridge engineer, in charge of construction. Marshall Dresser is resident engineer for the highway department.

Because of the innovation of design practice the structure was made a joint research project by the highway commission and the U. S. Bureau of Public Roads. Assisting the writers in this investigational work are E. S. Thayer, designing engineer for the state highway department, and George Davis, structural engineer for the Bureau of Public Roads, division of tests. The contract is held by the Mercer Fraser Co., Eureka, Calif., on a bid of $568,181. James D. Fraser, president of the company, is in personal charge of the work.

Uneven Filter Washing Remedied by Reducing Velocity

By J. E. LYLES

Engineer of Water Purification, Tampa, Fla.



Displacement of gravel remedied by more even washwater distribution

UNEVEN filter washing resulting from an unusually large area of washwater opening at the Tampa, Fla., waterworks plant has been remedied by a reduction in the rate at which washwater is applied. The unevenness of the washing had resulted in a displacement of the filter gravel. A reduction in washing rate was the alternative to costly reconstruction of the underdrain system.

The Tampa water-purification plant was placed in operation in March, 1926. (A description of the plant was published in *Engineering News-Record*, Sept. 9, 1926, p. 414.) While the filters themselves are of standard design, the underdrain differs considerably from that usually found. It consists of half sections of 6-in. cast-iron pipe spaced 12 in. apart, supported ½ in. above the bottom slab of the filter.

When the plant was first placed in service the rate of wash was set at 24 in. vertical rise per minute; this rate was maintained for over three years. Although the plant was under the supervision of an experienced man and the usual care was taken in washing filters, the washing soon became very uneven and unsatisfactory. Parts of the filters at the greatest distance from the central drain washed quite rapidly and cleanly, while nearer parts washed very poorly and frequently had to be dug into and the unwashed sand scattered over the filter. Digging into the sand revealed that the gravel had become displaced, and that in those areas in which the wash was good it was comparatively close to the sand surface. Periodic investigations by digging up the sand showed that this condition was slowly but surely growing worse.

In September, 1929, soundings were made in all the filters and a profile of the gravel bed was drawn. This profile revealed the serious displacement of the gravel bed that had taken place in 3½ years. This condition caused some alarm, and redesign of the underdrain system or placing a brass screen between sand and gravel was contemplated.

The washing rate had been determined by recording the time that it took for the water to rise 6 in. after it had risen above the washwater trough. The valve on the washwater line had been adjusted so that the water rose 6 in. in 15 sec., or 24 in. per minute. However, as the water rose over the sand area of the filter it was also rising in the space above the central drain, and an observed rise of 24 in. per minute gave a rate of wash not of 2 but of 2.3 cu.ft. per sq.ft. per minute.

In order to obtain even washwater distribution, past experience of numerous investigators has shown that the area of washwater openings in the laterals should be between 0.2 and 0.3 per cent of the sand area. In the Tampa installation, however, the area of the washwater openings is approximately 7.8 per cent of the sand area, and with a rate of wash of 2.3 cu.ft. per sq.ft. per minute, jet action and displacement occurred. Due to this comparatively large ratio between area of washwater opening and sand area, there was not sufficient loss of head through the washwater openings to distribute the pressure evenly throughout the laterals. More water was discharged from the ends of the laterals, where the total head available was the sum of the pressure plus the velocity head, than was discharged near the inlet of the laterals, where only the pressure head was available.

Obviously this condition could be remedied basically in only two ways, by decreasing the size of the washwater openings to a point where the resulting orifice loss would outweigh the effect of regained velocity head in the laterals, or by decreasing the velocity in the laterals to a point where the pressure distribution would be more uniform. Since the latter remedy involved nothing more than a change in the rate of wash, it was reduced from 2.3 to 2.0 cu.ft. per sq.ft. per minute. This reduced the velocity in the laterals by 13 per cent and still gave an adequate amount of washwater.

Shortly after this change was made the filters began to wash evenly, unwashed areas disappeared, and it was no longer necessary to spade up the sand and break up poorly washed areas. In March, 1930, soundings were again made and a marked improvement was found to have taken place in the six-month period. The hills had settled down, the valleys were filling up, and the gravel bed was resuming its original position.

Building Boulder City

Colorado River water now available—Sewer system well advanced—Administration buildings started—Six Companies complete housing facilities for 1,200 men and 308 small houses—Street work under way

FROM a desert waste of six months ago the site of Boulder City has been developed into a town of several hundred buildings housing a population of about 2,500 and provided with a water-supply system, a temporary sewage system, lights, telephone, transportation and other municipal facilities. The work of the Bureau of Reclamation, concentrated on providing municipal improvements, and the progress of the Six Companies in building housing facilities for their construction forces, carried out under the handicap of terrific heat during the past summer months, have laid the foundations for the town that will serve as the center for Boulder Canyon construction activity for the next few years. Municipal government of city-manager type was recently instituted, and 132 applications for business enterprises have been approved. Street surfacing will be under way shortly, and this work, together with the construction of the filtration plant and sewage-disposal works, will complete the major city improvement program.

City Plan—The town site spreads out roughly in fan shape (Fig. 2) from a ridge along the north side that separates it from Hemenway Wash. The high point of this ridge is occupied by the 2,000,000-gal. storage tank for the city water supply, and it is the location from which the panoramic view of the town (Fig. 1) was taken. The area is typical desert and has a fairly uniform slope of about 3 per cent to the south.

The two principal streets diverge from an intersection at the administration building, on the high ground to the north, to outline the business district and provide radial thoroughfares to the far corners of the town. These streets and others in the business district have a width of 92 ft. between property lines. Residential streets are 60 ft. wide and inclose rectangular blocks divided into lots 50 and 60 ft. wide.

A distinctive feature of the city layout is the four plazas in the business section that include extensive parking areas. It is planned that the introduction of these surfaced areas will practically eliminate parking on the business streets. A large park is planned for the block immediately fronting the administration building.

Progress in building construction, which is the principal visual evidence of municipal development, consists of the structures put up by the Six Companies for housing their organization and the several more permanent government buildings completed or under way. On the west side of town the contractor has concentrated the main group of dormitory, mess and adminstration buildings. In addition, rapid progress is being made on thirteen five- and six-room houses for construction officials on the blocks bordering their main buildings, and two larger residences for the general superintendent and executive officials of the organization on the height west of the storage reservoir. Also 135 three-room houses have been erected in the central residential area and 175 two-room houses along the southern edge of town. West of the town proper are located the extensive shop and warehouse buildings on railroad spurs. To the northeast, on the ridge overlooking the entire town site, the Six Companies are building a hospital building, with a group of residences for doctors and nurses.

The three major government buildings now under construction are the administration building to house the offices of the Bureau of Reclamation, a dormitory for unmarried men and a city municipal building in the business district. The government has completed the first group of twelve three- and four-room family houses, and the second group of twelve is being built. The buildings erected or under construction in Boulder City on Oct. 1 are indicated in Figs. 1 and 2 .

Types of Building Construction—Two distinct types of buildings are being built in Boulder City: (1) buildings erected by the government that will become part of

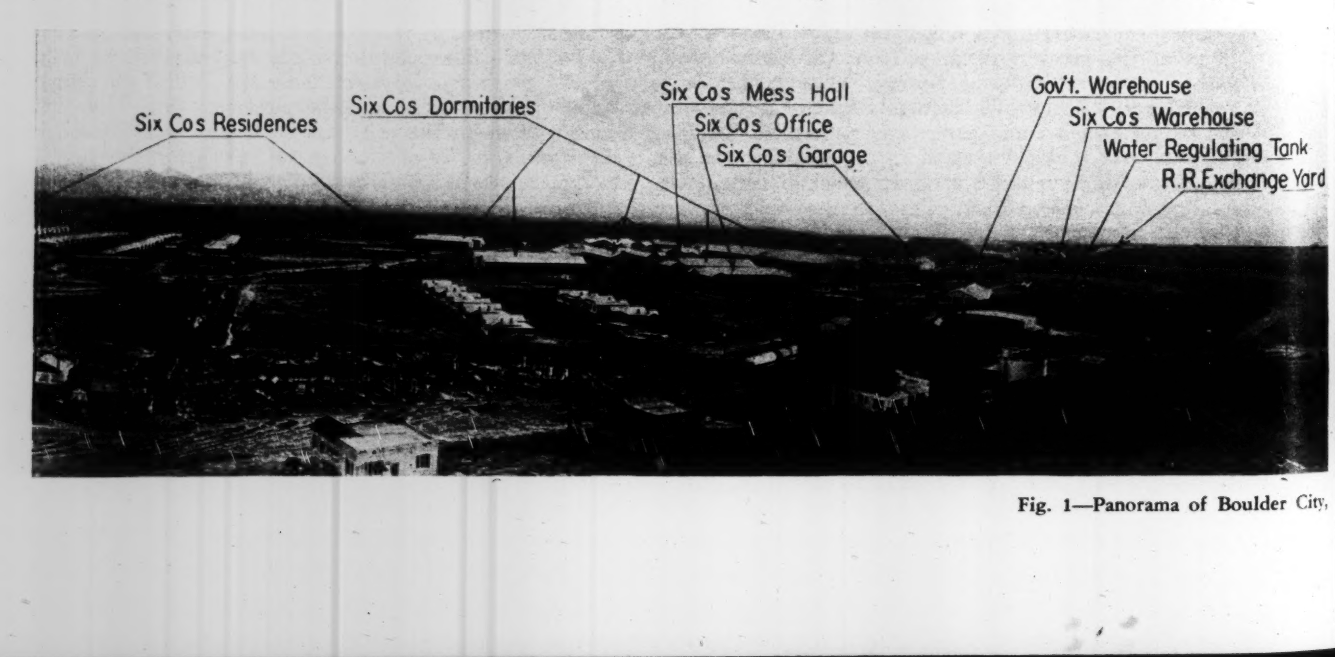


Fig. 1—Panorama of Boulder City,

the permanent town; and (2) buildings erected by the Six Companies for use primarily during the construction period. The exterior finish is the same in both cases, being stucco either in natural color or tinted.

The three main buildings under construction by the government are Spanish in architectural treatment, with reinforced-concrete floors, brick walls and tile roofs. The brick is laid up in a Flemish bond to produce a hollow wall. The 24 family houses now being erected by the government have the same brick wall construction but are covered with stucco and have tile trimmings. A 4-in. layer of rock wool is placed over the ceiling for insulation. The larger buildings are furnace-heated, and provision is made for individual room air-conditioning. Family houses are provided with a special fireplace designed for air circulation. These houses are equipped with electric ranges, water heaters and refrigeration.

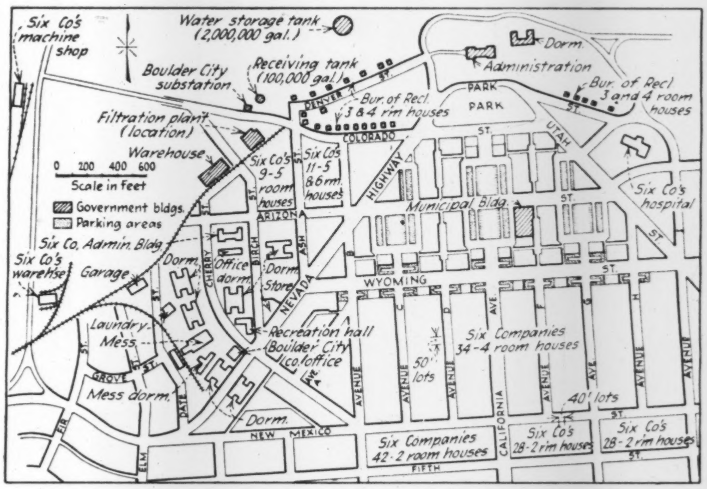

Six Co's machine shop
Water storage tank (2,000,000 gal.)
Boulder City substation
Receiving tank (100,000 gal.)
Dorm.
Administration
Filtration plant (location)
Warehouse
0 200 400 600
Scale in feet
Government bldgs.
Parking areas
Six Co. Admin. Bldg.
Six Co's warehse
Garage
Laundry-Mess
Mess dorm.
Dorm.
Office dorm.
Dorm. Store
Six Co's 9-5 room houses
Six Co's 11-5 & 6 rm. houses
Denver St.
Bur. of Recl. 3 & 4 rm houses
Park
Park
Bur. of Recl 3 and 4 room houses
Colorado
Highway
Utah
Municipal Bldg.
Six Co's hospital
Arizona
Cherry
Birch
Ash
Nevada
Wyoming St.
Recreation hall
Boulder City Co. office
Six Companies 34-4 room houses
50' lots
40' lots
Grove St.
Date
Fir
Elm
Dorm.
New Mexico
Avenue
California
Six Companies 42-2 room houses
Six Co's 28-2 rm houses
Six Co's 28-2 rm houses
Fifth
St.

Fig. 2—Plan of town, showing buildings erected or under construction

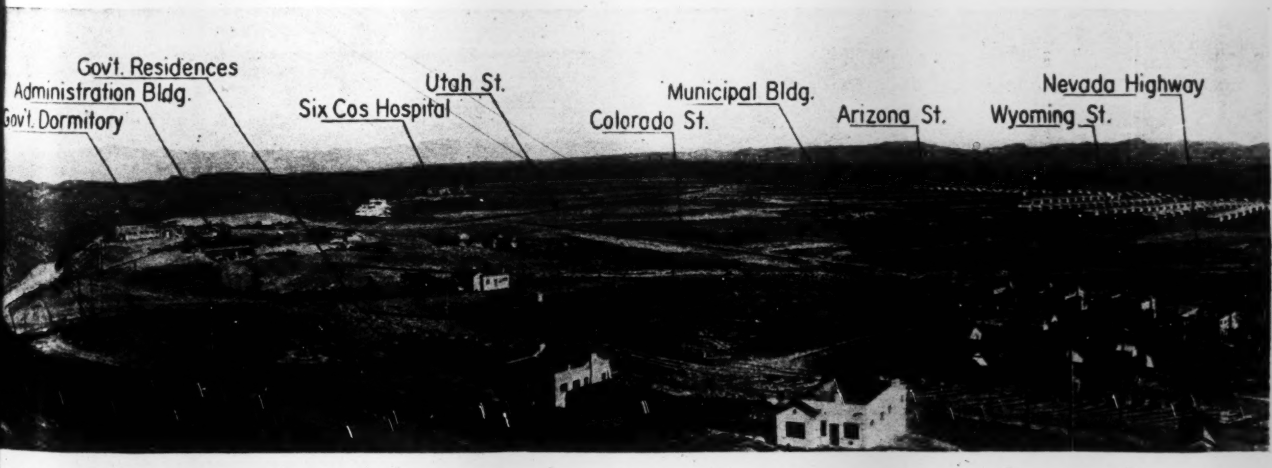
The typical construction used by the Six Companies in their buildings is a wood frame with gypsum plaster board on the outside covered with stucco and wall board on the inside. These buildings all have painted wood trim and roofs of asbestos shingles. The main group of buildings, including dormitories and administration building, will be heated from four central heating plants during the winter. The most unusual feature of these buildings is the provision for circulating washed and cooled air during the summer months. The ducts used for this purpose during the summer will be used for air-heating during the winter.

The small family houses built by the Six Companies for rent to their employees are of the same construction. Natural ventilation between ceiling and roof is provided by openings in the gables. The houses are equipped by the company with gas cooking ranges, and contract has been arranged to provide "canned" gas for cooking use, which will be paid for by the individual occupying the house.

Water Supply—The water supply for Boulder City, now avaible with preliminary treatment, is pumped from the Colorado River. After presedimentation at the river it is pumped 6¾ miles to a receiving tank at the town and will flow by gravity to a filter plant now under construction. From this plant the supply will be pumped to the main 2,000,000-gal. storage tank and delivered into the city mains by gravity with a static presure of about 80 lb. For the present the water is only being presettled and chlorinated at the river until the filtration plant is completed.

The river intake is equipped with centrifugal suction pumps on a movable platform to allow for rise in the river stage and to permit taking water from the clearest level of the stream. The water is lifted approximately 100 ft. into a 200,000-gal. presedimentation tank (Fig. 4) equipped for mechanical removal of the deposited silt. Depending on the rate of operation, this treatment will remove about 95 per cent of the suspended matter. The clarified water is lifted from the river-side pumping station by three four-stage centrifugal pumps of 650-gal. capacity each against an 1,100-ft. head through 4 miles of 12-in. line to the second pumping plant. Each pump is operated by a 200-hp. electric motor, and the station is provided with an automatic differential check valve in case of interruption.

At the second pumping station similar equipment lifts the water an additional 900 ft. through the remaining


Gov't. Residences
Administration Bldg.
Gov't. Dormitory
Six Cos Hospital
Utah St.
Colorado St.
Municipal Bldg.
Arizona St.
Wyoming St.
Nevada Highway

ooking south from water-supply tank

2¾ miles of line to the delivery tank at Boulder City. The second pumping plant is equipped for automatic operation, and the pumps cut in and out automatically according to the water level in a surge tank 90 ft. high which is connected in the line below the pumps.

The pumping line consists of 12-in. steel pipe between pumping plants No. 1 and No. 2, and 10-in. steel pipe above pumping plant No. 2, all 0.3 in. thick, fabricated in 40-ft. lengths with electrically welded longitudinal seams and coupled connections. The pipe was coated inside and out by dipping in a hot asphaltic bath. The line was completely buried under 3 ft. of cover. Construction of this pipe line over exceedingly rugged country during the excessive heat of the summer months presented unusual difficulties.

The city distribution system consists of 50,000 ft. of cast-iron pipe varying from 12 to 6 in., laid 3 ft. below ground. Service pipes are copper to the curb line. Eighty-five fire hydrants are included in the system.

Sewerage System—A system of vitrified-clay sewer lines is being installed, ranging in size from 6 in. to a maximum of 12 in. at the southeast corner of town. From this point a 12-in. outfall line extends about ¼ mile to the disposal plant. At present the line discharges into a temporary septic tank in the form of a timber-lined excavation. The effluent flows into a rocky gorge and is quickly absorbed in the dry desert sand. About 800 ft. south of the temporary tank a disposal plant will be constructed in the next few months. This will be of the separate sludge digestion type with gas collection; the effluent will be discharged as at present. The sewer pipe is being laid in the usual manner, using trench excavators and hot asphalt poured joints. The system is about 70 per cent completed. Concrete manholes are provided at intersections.

Streets and Sidewalks—Street work has logically been deferred until sewer and water systems have been laid and the trenches backfilled. With the completion of these systems on the various streets, grading followed; tractor-scraper equipment was used for the most of the work, supplemented by power shovel and trucks where he hauls were longer. Mule teams also are being used on some of the lighter work. The 150,000 cu.yd. of material to be moved consists principally of fine desert sand, although some rock shooting has been required on the higher ground. About 60 per cent of the excavation will be used in fill and the rest wasted. Grading is 70 per cent completed and is kept close behind the water main and sewer work.

Three types of street surfacing will be laid, depending on location and use: (1) two-course asphalt-concrete paving 5 in. thick on Nevada Highway and Arizona St., the principal thoroughfares (46,150 sq.yd.); (2) one-course asphalt-concrete paving 2 in. thick on 3-in. waterbound macadam base, on all other important streets (43,850 sq.yd.); and (3) 1½ in. of oil-treated gravel on a 3½-in. waterbound macadam base on the remaining residential streets (128,000 sq.yd.). Paved widths are 56 ft. in the business district and 30 ft. in the residential area. As a part of the street-surfacing work, 94,000 lin.ft. of combined curb and gutter will be required.

Sidewalks (4-in. concrete) will be 12 ft. wide in the business section and 4 ft. wide elsewhere. The outlying streets will be provided with 4-ft. walks of rolled gravel 4 in. thick. All of this street and sidewalk work is scheduled for completion by early spring.

Municipal Government—The city manager, reporting to the construction engineer in charge of the project, has charge of all the usual municipal functions, including collections from leases, utility operations, street work, parks and fire department. He will be assisted in his work by a staff of municipal employees as required by the development of the community. An advisory commission consisting of two government officials and one representative from the Six Companies will consult with the construction engineer and city manager and advise on city administration.

Water will be retailed by the city government to all houses and commercial establishments. The Six Companies will take a combined service for their main buildings, but their family houses will have individual water services. Electric service to private businesses will be retail. This type of service will be extended to the family houses of the Six Companies by that organization, which has elected to take power under a wholesale schedule and provide these blocks with a separate distribution system. According to the terms of the main contract, the contractor pays a monthly sum of $5,000 for the use of land occupied in Boulder City and for other civic facilities. All other permits for occupancy of land will be on a lease form with rents payable to the municipal government.

Approvals of applications to do business in Boulder City totaled 132 on Oct. 1. These approvals had been made after careful study and rating of the qualifications of the firm or individual both as to character and financial standing. The highest ratings were approved first, and in nearly all cases restrictions have been made as to

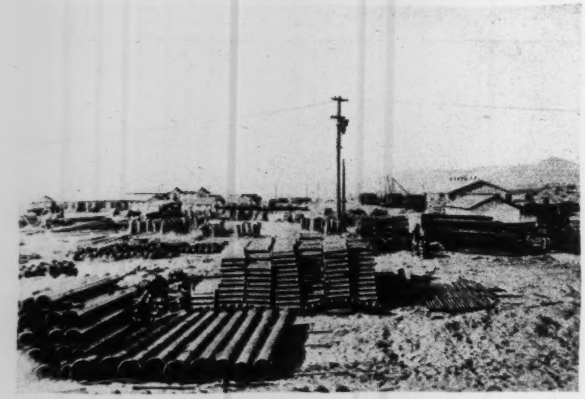


Fig. 3—Supply yard with stock of sewer and water system material for Boulder City utilities

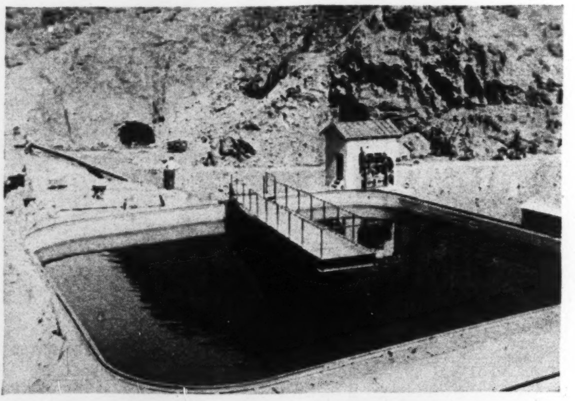


Fig. 4—Presedimentation basin at river with portal of diversion tunnel No. 4 on Arizona side in background

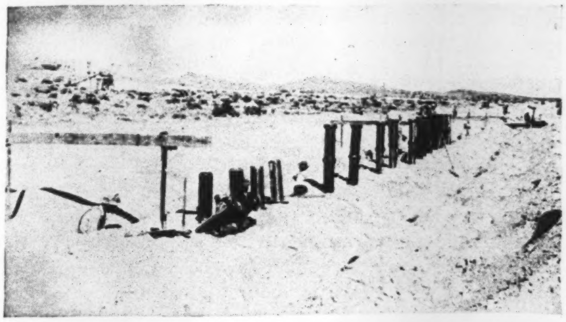


Fig. 5—Typical sewer-laying operations preceding street work

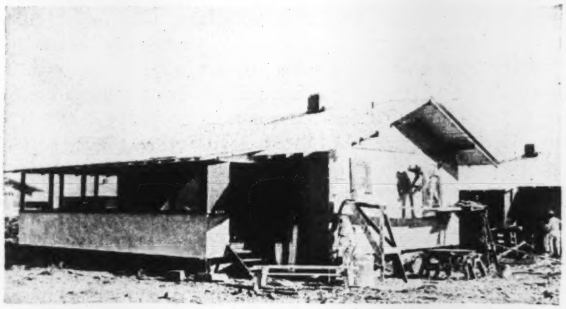


Fig. 6—Six Companies three-room house, with stucco finish

number of establishments to be allowed of a particular kind. All classes of commercial establishments and professional activities are represented. The lease form probably will be on a ten-year basis, payments being based on a definite appraisal of the property occupied both for business and residential lots.

Organizations—Operations of the Six Companies, Inc., in Boulder City have been carried on by their own forces under the direction of Frank T. Crowe.

Principal separate contracts let by the government for municipal improvement have been: (1) construction of water line and pumping plants, Wheelwright Construction Co., Ogden, J. L. Griffith, superintendent; (2) water mains, sewers and street work, New Mexico Construction Co., Albuquerque, E. D. White, superintendent; (3) main government buildings, B. O. Seigfus, Salt Lake City; (4) water-purification and sewage-disposal plants, Stearns Roger Co., Denver, Colo.

Organization of the Bureau of Reclamation on this project directly connected with construction work at Boulder City includes: Walker R. Young, construction engineer, in general charge of the entire Boulder Canyon project; John C. Page, office engineer; Ralph Lowry, field engineer; R. C. Thaxton, associate engineer supervising Boulder City construction; Joseph Talla, in charge of water-supply line and electrical construction.

Sims Ely recently was appointed city manager of Boulder City.

Jack-Knife Drawbridge Design

Replacement of six unusual jack-knife drawbridges in the Boston & Maine Railroad terminal at Boston was described in our issue of Nov. 5. At that time it was stated that little was known of the origin of these bridges. We have since been advised that the bridges were invented by the late Joseph Ross, of Ipswich, Mass., back in the 40's and that the design was patented by him at that time.

Recent Engineering Law Decisions

By HERBERT BRAASCH
Attorney-at-Law, New York City

Architect's Financial Interest in Project

Contract for electrical work on the Terminal Building, Dallas, Tex., stated the architect was to be the interpreter of the conditions of the contract and the judge of its performance, and was to side neither with the owner nor the contractor but to use his powers to enforce faithful performance. His functions were to include the determination of payments as the work progressed, as well as the fixing of cost on extra work.

The terminal company was permitted by the contract to alter plans and specifications, and the contractors were in any case to proceed with the work. There was to be no abandonment because of dispute nor any stoppage for an appeal to arbitration.

The architect, unknown to the contractor, was a director, promoter and substantial stockholder of the Terminal Building Co., and he had guaranteed to the company that construction would not exceed his estimate. If it did, he would forfeit a substantial sum of money.

Before completion the contractor abandoned the work after the architect refused in his estimates certain claims of the contractor. The contractor then sued the owner for the reasonable value of work already performed, to which the owner set up the contract provision requiring that work was in any case to proceed. The contractor replied there was a prior breach of the contract by the owner when it knowingly designated as architect a party financially interested in reducing the cost of the work at the contractor's expense.

The owner contended that after making the agreement, but before entering upon a performance of it (i.e. before starting the work), the contractor did learn that Whitson, the architect, was a director and stockholder, and that by then proceeding with work the contractor waived objection. The court, admitting the owner's position was sound as far as it went, added that the contractor's waiver of the architect's bias did not go further than his knowledge of such bias. It disposed of the objection that the architect was a director and stockholder without the knowledge of the contractor nor the realization that the architect stood to forfeit $50,000 as a penalty if his estimates were exceeded.

Such interest is greater than that of director and stockholder, and because of the direct pecuniary interest a presumption arises that every estimate made while under such liability was a partial and biased one, and it is unnecessary to show that the architect's decisions were unjust or partial. With the provisions for an architect's fixing of price eliminated, there was no method of determining the sums due the contractor, and in such circumstances he had the right to abandon the job and seek court aid to determine the reasonable value of materials and labor supplied.—*Manett Seastrunk & Buckner vs. Terminal Building Corp., Texas.*

Damage to Rented Equipment

Mathis & Sons leased a portable cement mixer to the Grant Construction Co., who used it in building approaches for a reconstructed bridge, and upon completion of the work left it upon the highway without proper lights to indicate its presence. The owner was at the same time notified to come and get it, but the Grant

Construction Co. also stated they would hold it three or four days while its men cleaned it. Substantial damage accrued to the mixer from a collision caused by the presence of the mixer unlighted at night on the roadway.

Unless there is a contract to the contrary, property is at the risk of the owner rather than at the risk of the person who hires it even when it is in the latter's possession. A notice placing property at the owner's disposal terminating the relation absolves the hirer from a term by which he assumed risk during possession.

A jury found in this case that the Grant Construction Co. had not severed its relation because it stated it would hold the equipment another three or four days. Also because the injury resulted directly from the negligence of the hirer it stood in the position of any person whose fault has produced an injury, and so it is liable for the expense of reconditioning the mixer.—*Mathis & Sons vs. Cranmer et al, New Jersey.*

Relief From Onerous Zoning

East Providence Mills for a number of years operated its mill on No. 188 Grosvenor Ave. and owned lots adjoining, which had been purchased with plant expansion in view. A zoning ordinance was adopted by the city, which made the mill building the boundary for business classification and placed all the other lots in class A residential zone. A permit for a building extension was denied by the building department and was referred to the zoning board, which denied the appeal.

The mill continued its appeal, claiming the inclusion of these adjoining lots in a residential district was made without reasonable consideration of the character and location of the property and was unreasonable and deprived the owner of beneficial use of its land. The board had been vested with a discretionary power and could have authorized an exception.

The court held that zoning regulations are to be made with reasonable consideration of the character of the district and its peculiar suitability for particular uses and with a view to conserving the value of buildings and encouraging the most appropriate use of land throughout the municipality. This is to be distinguished from the case of an owner in a residential district to secure an exemption whereby a business use is introduced into a restricted zone. The zoning boundary at this place has imposed an unnecessary burden.

The owner established by real estate experts that there were no profitable uses for the lots except for the mill addition, that they were not suitable for profitable use for class A dwellings and that no substantial injury to adjacent property would result. The zoning board should have allowed the exception.—*East Providence Mills vs. Zoning Board of Review, Rhode Island.*

Grade Separations and the Limitations of Lien Laws

The extent of rights in property created out of the services and goods of the subcontractor and material man is traced nicely in the following situation.

To provide easy access to its plant, the Ford Motor Co. obtained permission from the Detroit department of street railways and the Pennsylvania Railroad to construct a grade separation and underpass through these owners' rights-of-way. The Blair Construction Co., obtaining a contract from the Ford Co. for this work, let numerous subcontracts, purchased materials and was progressing with construction when the Ford Co. rescinded the contract and completed the work after a dispute had arisen.

Unpaid subcontractors and material men, in an attempt to get redress, claimed liens against the city department, the railroad and against the Ford Motor Co. As against the city, a material man's protection lies in the surety bonds required in public works contracts, and the lien laws in Michigan and most other states do not by their terms extend to railroads, street railways or municipalities. Also there was no contract for construction to which either the railroad or the city was a party; they only granted to the motor company this right for the motor company's convenience. As for the Ford Co., there was of course such authorized construction, but the structure was located almost entirely upon the physical properties of the city and the railroad.

It was argued that the underpass, though not built upon land occupied by the Ford plant, was nevertheless a property right incident to and necessarily connected with the use and enjoyment of the plant property and hence was a part of the plant of the Ford Co. and a lien upon it. The court held it to be a property interest of the motor company, but held such interest or property could not be the subject of a lien because it could not be separately sold or mortgaged, and because it was detached from the other property it was without value and non-existent as a real property right.

A part of the structure was, however, constructed upon the land of the Ford Motor Co., and this was claimed to be the basis for a lien. The court denied it, stating that no lien could exist on a part of a structure. It must apply to the whole thing or to none.

Resort was also made to the rule that where the party authorizing construction has the building erected upon land that is not his own, the contractor or material man may regard such building as personal property and remove it; but this was unavailing because in a sense the motor company did have an interest in the land, also the grade separation was one single unit that could not be removed without distroying; it cannot be taken apart and its elements separately sold. Hence this is a property which in no way is lienable.—*McClintic Marshall Co. vs. Ford Motor Co., Michigan.*

Attractive Sludge Tanks

Three types of digestion-tank construction providing for the support of stirring mechanisms were described by John L. Mason, research engineer of the Hardinge Co. before the recent Pittsburgh convention of the American Society of Municipal Engineers. In one type a truss-bridge superstructure, supported on the side walls, spans the tank and supports the mechanism and driving equipment. The architectural effect is not pleasing when the tank proper is buried, and two other types have been developed to be less unattractive. In one method of construction heavy beams span the tank and carry the earth backfill and mechanism load. Another type has the tank roof formed by a thin concrete dome, supported by the side walls. In this last method steel bands are placed around the abutment section and prestressed after the dome is cast while it is still supported by the formwork. By adjusting the stress in the bands a fixed-abutment condition is obtained. A circular opening is left at the center of the dome, around which is placed a heavy curb ring. The mechanism load is transferred to the dome by this curb. Studies indicate that a dome with a ratio of rise to span of $\frac{1}{10}$ is most economical.

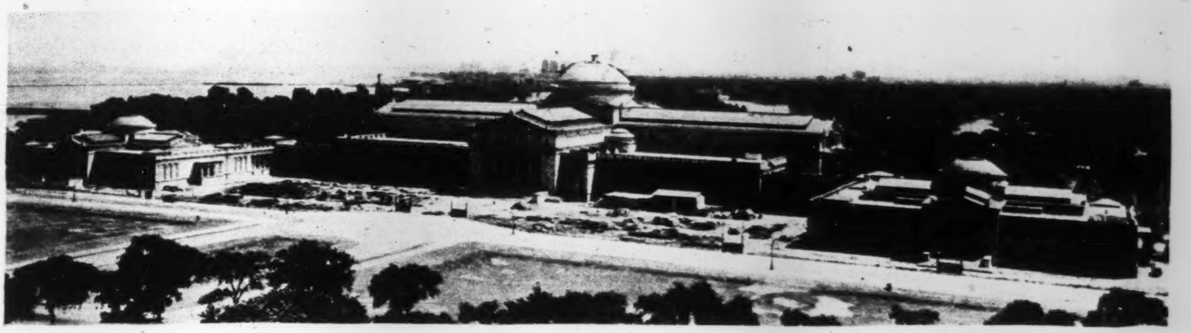


Fig. 1—Chicago Museum of Science and Industry

Chicago Fine Arts Building Reconstructed to House Industrial Museum

Structure of 1893 rebuit as home of Rosenwald museum—Old steel in good condition—New cantilever girders to carry steel dome are anchored to concrete piers—Stone replaces exterior plaster facing

By TRENT E. SANFORD
Staff Architect, Museum of Science and Industry, Chicago

RECONSTRUCTION is now nearing completion of the noted but temporary Fine Arts Building of the Chicago World's Fair of 1893, which is to become a permanent structure housing the new Museum of Science and Industry, founded by Julius Rosenwald. The structure has included difficult and complicated work and as now rebuilt to the original design is shown in Fig. 1. It is situated in Jackson Park at 57th St.

The old building of the World's Fair was of such architectural beauty that its preservation was widely advocated, but because of its exterior covering of plaster composition, together with wood and plaster columns and decorative work, it soon began to deteriorate. It comprised a central structure with two wings or pavilions, as shown in Fig. 2, the whole covering an area of about six acres. In structural design it consisted of heavy brick walls supporting steel roof trusses, together with interior steel columns and framing. This type of construction was adopted to insure a safe and fireproof structure for the valuable paintings and art exhibits.

From 1894 to 1920 the building was utilized by the Field Museum of National History, prior to the construction of its present handsome building on the lakefront at 12th St. During that time the old structure was kept in fair condition by occasional patching and repair, but after that occupancy it became neglected, as there were no means for adequate care. Public favor continued, however, and in 1924 the voters of the South Park territory approved a bond issue of $5,000,000 for the restoration of the building.

When the bond issue was submitted to the voters a number of proposed uses for the building were considered, among them the establishment of a technical museum. Subsequently Mr. Rosenwald made his offer to the South Park Commissioners of $3,000,000 for an industrial museum, this being conditioned upon the provision of that site and the preservation of the architectural design of the exterior of the Fine Arts Building. This offer was accepted, and at first it was proposed to erect an entirely new structure. But in order to preserve the original design, Mr. Rosenwald agreed to pay whatever deficit might remain after expenditure of the $5,000,000 bond issue, on condition that the building should be used exclusively for an industrial museum. One of the unusual features in this reconstruction work arose out of the terms of the bond issue, which required the South Park commissioners to reconstruct the exterior to the same design and dimensions as those of the original building. At the same time the terms permitted the design of the interior to be adapted to the purposes of a technical museum.

Foundations and Walls—When the reconstruction contract was let, in September, 1929, one of the first jobs was to replace such concrete footings below the 10,000 lin.ft. of brick wall as had become spongy or weak during their 40 years of submergence in the wet sandy soil of Jackson Park. The contractors took out and rebuilt 4,700 lin.ft. of these old footings, working in sections 4 ft. long, so as to avoid the necessity of expensive shoring of the wall. All the old interior steel columns were removed, and new concrete footings were provided for the new columns.

There are more than 2,000 ft. of brick wall, 3 ft. thick, all solid masonry, and an additional 3,000 ft. that is more than 2 ft. in thickness. These brick walls offer an interesting study in the durability of building materials. Intended originally for a temporary structure, only a rather cheap grade of common brick was used, and this was covered on all exterior surfaces with plaster composition known as "staff." Standing within a few yards of the Lake Michigan shore, unprotected from storms and moisture, the staff gradually crumbled and exposed the brick in several places. Subsequent attacks of the weather ruined much of this exposed brick, and it was expected that large amounts of brick replacement would be necessary. It was found, however, that where the staff was still perfect, or had come loose within the preceding year or two, both the brick and the mortar were in excellent condition, needing only some permanent protection from the weather to make them usable for many decades to come. This protection has now been applied in the form of a complete exterior covering of limstone. In Fig. 3 is shown the placing of this new stonework.

The use of Indiana limestone for the exterior of the building was decided upon after receiving alternative bids on a variety of marbles, granites, limestones and terra cotta. The stone contract involved about 350,000 cu.ft., weighing 28,000 tons. There are 140 exterior free-standing Ionic columns composed of stone drums, the completed columns weighing from 5 to 50 tons each. In addition, there are 135 engaged or built-in columns. Carved moldings aggregate several miles of stone.

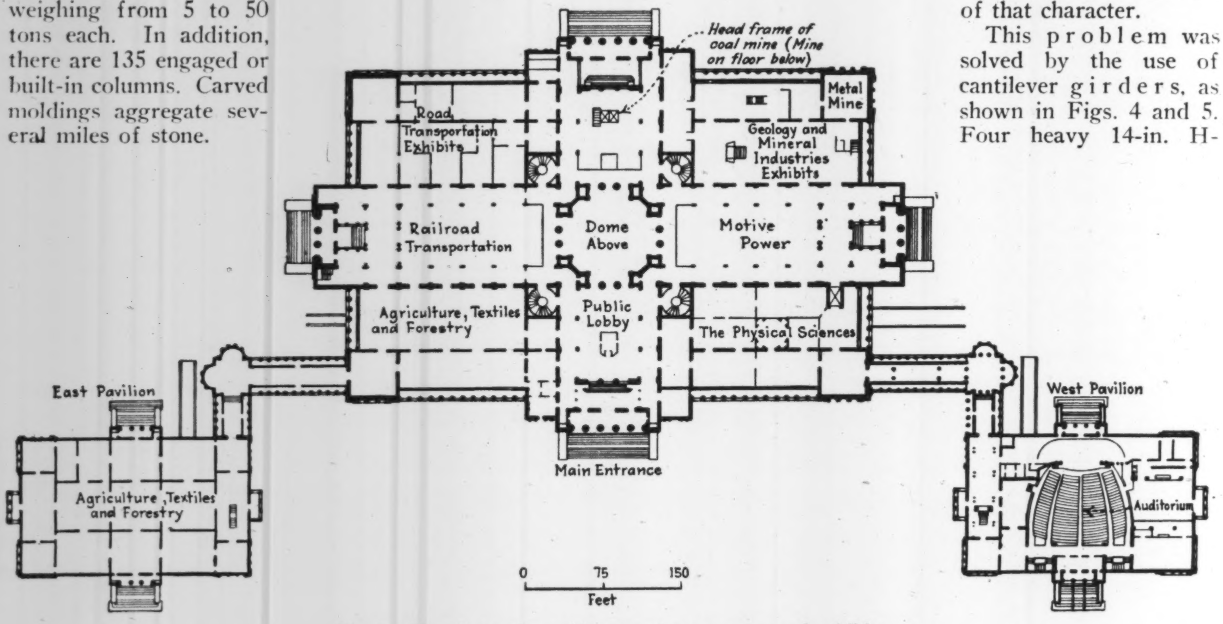

Head frame of coal mine (Mine on floor below)
Metal Mine
Road Transportation Exhibits
Geology and Mineral Industries Exhibits
Railroad Transportation
Dome Above
Motive Power
Agriculture, Textiles and Forestry
Public Lobby
The Physical Sciences
East Pavilion
West Pavilion
Agriculture, Textiles and Forestry
Main Entrance
Auditorium
0
75
150
Feet

Fig. 2—First floor plan with general arrangement of exhibits

Flanking the north and south entrances of the central pavilion and on the east and west sides of the end pavilions are caryatid porticoes inspired by a similar portico on the Erechtheum at Athens. There are 24 of these caryatid figures, 15 ft. high and weighing about six tons, each carved from a solid block of stone. Above the entrances to the central pavilion are 20 other figures, 12 ft. tall and weighing almost five tons each. The carved figures were shipped from Bloomington, Ind., on a special train and under the care of a special crew, to avoid jarring and prevent damage to the individual figures.

Structural Steelwork—The original steel framing included 44 interior columns of channel-and-lattice construction, with floor system, numerous roof trusses, a dome of 72 ft. diameter over the center of the main building, and a 46-ft. dome over each of the side pavilions. In the nine years of neglect, when the building stood unoccupied, many rain storms had reached the steel roof trusses; yet so effective had been the protection of the paint that some of the steel erected in 1892 is being used in the new reconstruction. Much more would have been used if the new design of the roof had not called for heavier construction. The steel framework of the 72-ft. central dome, where very little water had found its way, was in perfect condition, untouched anywhere by rust and forming a striking example of the effectiveness of proper paint protection against atmospheric damage.

Supporting the Large Dome—Interesting items of construction in the west pavilion were involved by the necessity for maintaining the exterior design of the old building. For reasons of utility it was decided to place the auditorium, accommodating 1,200 persons, under the west dome of the building. But at the same time the museum officers declined to permit the introduction of any columns within the auditorium to support the dome. The problem was to support the great mass of this dome above the center of the ceiling of an auditorium extending 30 ft. beyond the dome in all directions, and at the same time to retain maximum ceiling height, which was badly needed in a room of that character.

This problem was solved by the use of cantilever girders, as shown in Figs. 4 and 5. Four heavy 14-in. H-columns with flanges 2 in. thick were placed, two flanking the proscenium opening and two others at corresponding points in the rear wall. Cantilever girders of heavy cross-section, but only 5 ft. deep, are carried on the tops of these columns. The cambered and cantilevered ends of the girders overhang the auditorium and support a rectangular frame of four girders, which forms the base of the dome structure. The shallow depth and tapered ends of these beams made possible an auditorium of good height under an exceptionally low roof. These dome-supporting girders are shown in Fig. 6. At *A* and *B* are the ends of two of the cantilever girders, one of which is seated on the fulcrum column *C*, while *D*, *E*, *F* and *G* are the four girders forming the rectangular base for the dome framing.

To absorb the heavy upthrust on the outer ends of the cantilevers, vertical steel tension members attached to the ends of the anchor arms are carried from the roof line to the ground, where they are connected to anchor rods embedded in concrete. These concrete anchors (Fig. 7) are piers 8 ft. in diameter and about 30 ft. deep, belled out at the bottom to a 16-ft. diameter. They are similar to the foundation piers common in Chicago building practice but with the difference that instead of distributing

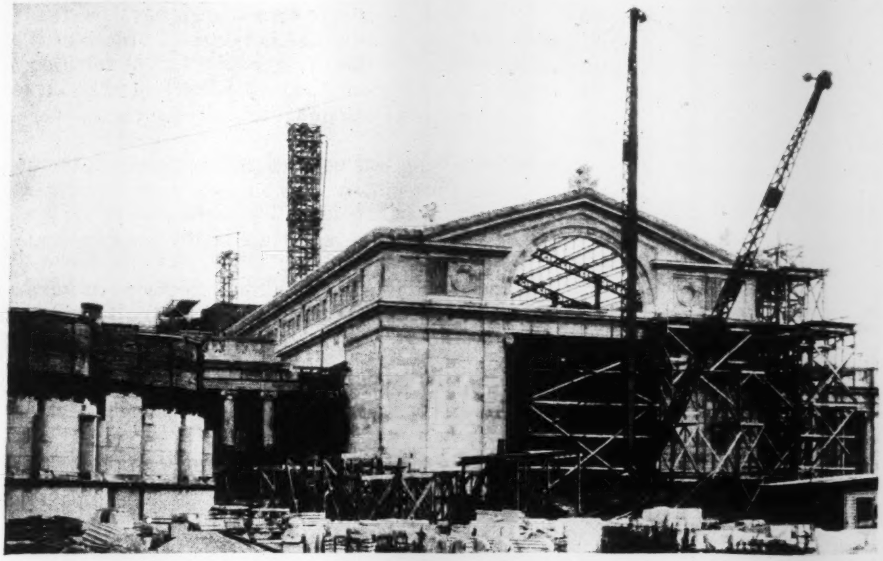


Fig. 3—In reconstruction, old plaster facing over brick walls, as shown at left, is being replaced by new masonry

a load on the soil their purpose is to resist the uplift load on the anchor arms of the cantilevers. The four anchors together weigh more than 500 tons, which is a mere bagatelle to the builder of suspension bridges, but somewhat unusual in building construction.

Other steelwork in this building is of considerable interest. The auditorium balcony, 100 ft. long and 21 ft. wide, is too shallow to permit the introduction of a 100-ft. girder to support the usual cantilevered floor construction. To reduce the 100-ft. span, the corners of the balcony are spanned by two diagonal girders. The transverse girder, reduced to 71 ft. 9 in. in length, rests on these diagonals.

The steel framing of the first floor of the central pavilion, or main building, looks more like a railway bridge than the conventional structure of a modern steel building. In fact, part of the floor actually constitutes a railway bridge, for one entire court, 100 ft. wide and more than 200 ft. in length, will be filled with railroad rolling stock, and the floor is built so that each rail will be located directly above a floor beam. In other parts of the building, where live loads of 250 lb. per sq.ft. are the rule, it was found more economical to carry two 30-in. I-beams side by side across a 30-ft. span.

In the original building the openings of the entrance loggias, more than 40 ft. in width, at the east and west ends of the central pavilion were broken up by two Ionic columns 40 ft. high, consisting of wood and plaster over a steel core. After the large exhibits have been installed, their places will be taken by new columns of the same design but consisting of 50 tons of limestone in each column, cut into seven sections or drums, each section weighing over seven tons. Their place is at present taken by a built-up steel lintel 4 ft. in depth, which spans the whole opening, in order to leave room for bringing in large exhibits.

At the center of the building heavy brick piers with their concrete stepped footings easily supported a dome of plaster facing, but the substitution of stone for the plaster would have created a different problem. These piers are retained; but in order to avoid very expensive underpinning, terra cotta was substituted for stone covering on this dome, which rises 135 ft. above the main floor.

Miscellaneous Features—Except for balconies in a part of the space, the old building had but one floor, which was of wood and raised well off the ground, but with only the earth below it. The museum authorities wanted two complete floors, as well as more balcony space, but the exterior had to appear exactly as in the original. To accomplish this, the new first-floor level was established almost 5 ft. higher than its old level and will be reached by additional broad steps inside the entrance. Beneath it and throughout the whole building the ground was excavated, and thus almost six acres of new floor area will be gained. Aside from exhibit space, which will occupy more than half of this new ground floor, there will be a large receiving room with truck entrance, a photographic department, store rooms, a cafeteria, children's lunchroom, private dining room, kitchen, an emergency hospital, toilets, locker rooms and shops for model-making, in addition to such building services as boiler and fan rooms and space for electrical equipment. There will be six separate heating plants and four widely

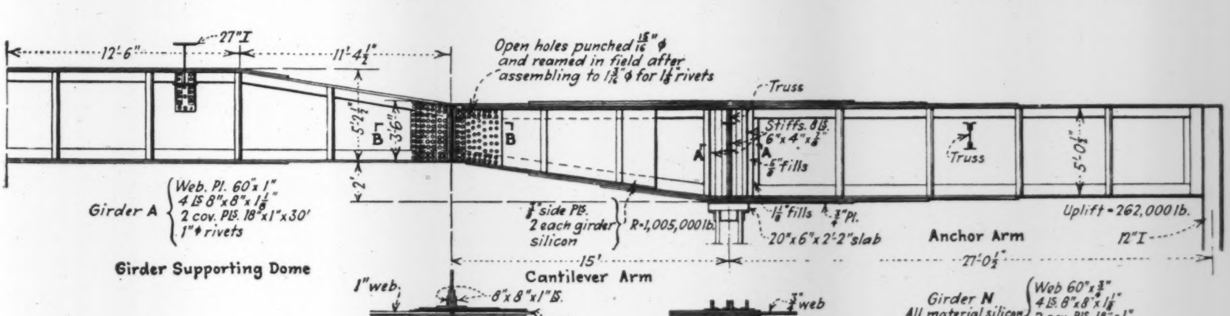

12'-6"
27"I
11'-4½"
Open holes punched 15/16" ϕ and reamed in field after assembling to 1 3/16" ϕ for 1⅛" rivets
Truss
5'-2½"
3'-6"
2'
B
B
Stiffs. 8 Ls. 6"x4"x⅞"
A
A
⅝" fills
Truss
5'-0¼"
Girder A
Web. Pl. 60"x1"
4 Ls 8"x8"x1⅛"
2 cov. Pls. 18"x1"x30'
1" ϕ rivets
Girder Supporting Dome
⅞" side Pls. 2 each girder silicon
R-1,005,000 lb.
1⅛" fills
¾" Pl.
20"x6"x2'-2" slab
Anchor Arm
Uplift-262,000 lb.
12"I
15'
Cantilever Arm
27'-0½"
1" web
8"x8"x1" Ls.
¾" web
Section B-B
¾" web
Truss
Section A-A
Girder N
All material silicon steel except fills and stiff. Ls.
Web 60"x¾"
4 Ls. 8"x8"x1⅛"
2 cov. Pls. 18"x1"
2 " " 18"x¾"
1" ϕ rivs. except as noted

Fig. 4—Girders that carry 72-ft. steel dome

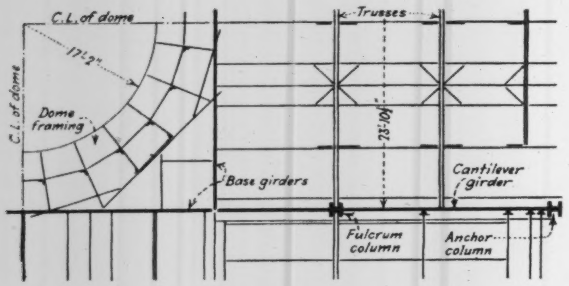


Fig. 5—Cantilever support for dome

separated transformer vaults and switching rooms, in addition to a central control room.

A 15-ton freight elevator will run from the receiving room to the first floor and the first balcony above, with another freight elevator in each of the smaller pavilions. In the central pavilion there will be two passenger elevators running to a second balcony, which, extending around three sides of each of the four main courts, will house the administrative and business offices and the library. On the first balcony air-transport exhibits will be shown. Full-sized balloons and airplanes will be suspended by cables from the ceiling of the court, special provision having been provided on the roof trusses, for their support.

In the old building the greater part of the roof was covered with skylights. In the reconstruction, with the exception of skylights for the business office, library and certain studios, these have been replaced with solid roofing materials, as it was decided that electric light, easily controlled, would be better for the display of exhibits. Three different roofing materials have been used; felt and gravel for the flat roofs, tile for the curved surfaces of the domes and copper for the sloping roofs, which for the most part were formerly glass. More than 200,000 lb. of copper were used in this work; much of it, such as the finials and the ridge crestings, is of intricate, ornamental design. More than 40 workmen were kept busy for a period of six months applying the copper-work alone.

Since the building was not designed originally to house an industrial museum, it was necessary to remove a number of the interior supporting walls and to replace them with steel columns and thus secure greater flexibility. In the quadrant, which will house the full-size coal and metal mines, two additional floors were introduced, one between the ground floor and the first floor and the other above the first floor. To effect this, the ground floor was lowered 20 in. and the first floor raised 29½ in. Headroom being at a premium, the architects specified 16-in. I-beams, connected in pairs and with stiffening plates. Each pair when finished is about 3 ft. wide.

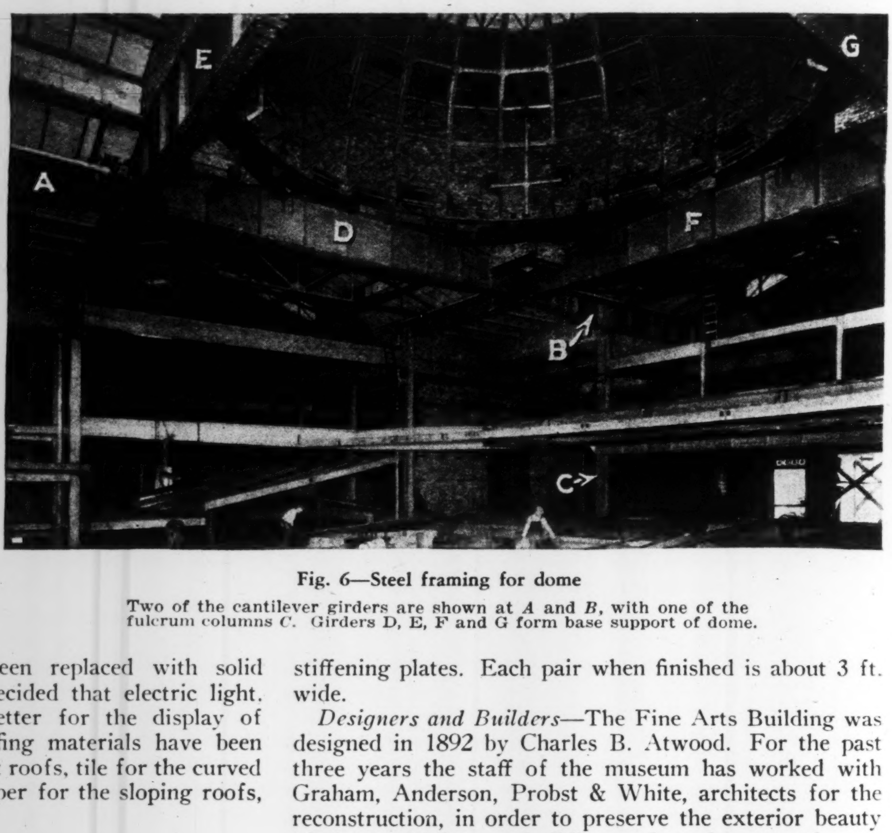


Fig. 6—Steel framing for dome

Two of the cantilever girders are shown at *A* and *B*, with one of the fulcrum columns *C*. Girders D, E, F and G form base support of dome.

Designers and Builders—The Fine Arts Building was designed in 1892 by Charles B. Atwood. For the past three years the staff of the museum has worked with Graham, Anderson, Probst & White, architects for the reconstruction, in order to preserve the exterior beauty of the world-famous building and at the same time to secure an interior fully fitted for the requirements of the museum. All steel design was under the direction of Magnus Gunderson, chief structural engineer for the architects. The museum staff is now headed by O. T. Kreusser as director; he recently succeeded J. R. Van Pelt, who in turn had succeeded Waldemar Kaempffert. The general contract for the exterior reconstruction, including the roof, was let to R. C. Wieboldt & Co., and the work was supervised by inspectors from Robert W. Hunt & Co. A separate contract will be let for the extensive interior alterations. It is expected that the building will be completed late in 1932. It will then be turned over by the park commissioners to the sole ownership and control of the Museum of Science and Industry, which is an incorporated body.

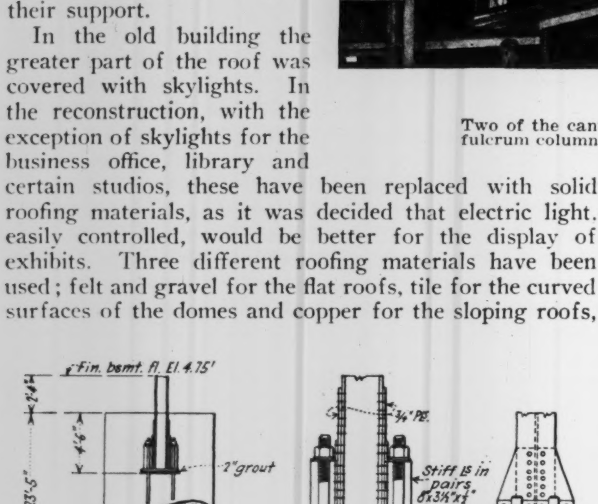


Fig. 7—Anchors for cantilever girders

FROM JOB AND OFFICE

Hints That Cut Cost and Time for the Contractor and Engineer

Concrete Mixer Grinds Manhole Covers to a Tight Seat

SEEKING an effective way to eliminate the rattling of manhole covers, Harold Steimer, an employee in the underground department of the Union Gas & Electric Co., Cincinnati, Ohio, adapted an old concrete mixer for use as a grinding machine. The method is described in *Hail, Columbia,* house organ of the Columbia Utilities System. The mixer drum was turned to rotate parallel with the street surface, and a pipe shaft with a cross-arm run from its center to the pavement level. Lacking two diagonal holes to engage the cross-arm, the letters U and O in the company's name, which happened to be on opposite sides of the cover, were used to engage the two square-headed bolts at the ends of the arm. The grinding compound was a heavy grade of abrasive powder in a base of kerosene and grease.

Machine for seating manhole cover

This device has proved very effective and has been of major assistance to the company in its campaign for elimination of unnecessary noise.

* * *

Modernizing Gate Valves at Detroit

By M. D. CORBIN,

Assistant Mechanical Engineer, Department of Water Supply, Detroit, Mich.

PRIOR to 1931 all gear-operated gate valves of the Detroit department of water supply had cast-iron gears with molded teeth. Gates using gears are of the 24-, 30-, 36-, 42- and 48-in. sizes; all gates 6 in. and more are in wells. Considerable difficulty has been experienced with the operation of these gates because of irregularities in the cast teeth, cement mortar spilled on the gears when making the well roof and mud in the bottom of the wells.

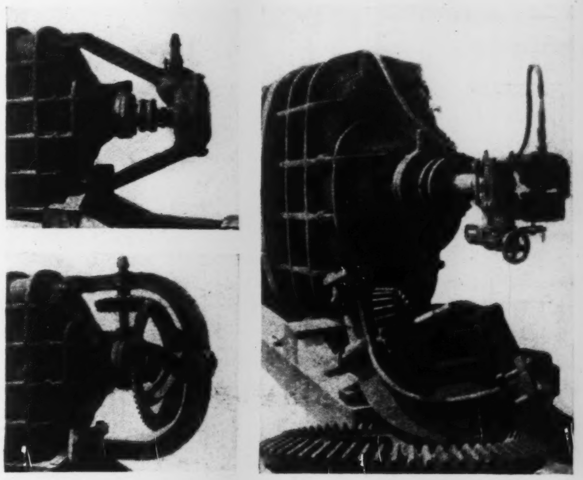
Because of the difficulty of operation George H. Fenkell, superintendent and general manager, has issued orders that all gears be inclosed in a housing so that they may run in oil. In order to make the housing of reasonable size it was found necessary to reduce the size of the gears and to use cast steel instead of cast iron on all sizes except the 24-in. The gears now used all have cut teeth, the strength of which has been checked by the Lewis formula, using the amount of torque necessary to open each size of gate with 200 lb. per sq.in. pressure on one side of the gate and no pressure on the other.

In order to leave room for a stuffing box where the main stem goes into the housing the new gears had to be placed on the end of the old stem. This meant filling in the old keyway in the main stem and cutting a new one, a difficult operation to perform without putting the gates out of service. For cutting the new keyway an air drill equipped with an arbor holding a high-speed milling cutter and a holder was designed to feed the milling cutter two ways along the length of the stem and up and down.

The work order calling for the replacement of the old gears and gear brackets with new gears and gear housing is as follows: break a hole through the pavement and the top of the well large enough for the gear housing. Remove the old gears and brackets, place keyway cutter, cut keyway by air power, fill old keyway, set new housing, set new large gear, place cover of housing, fill with reclaimed oil from garage, set new gate box over new pinion shaft, replace roof of gate well, backfill and replace pavement.

Equipment used on the job consists of one air compressor, two air chisels, an air drill for cutting keyways, and one truck with a pump on the front for pumping out wells. The crew consists of one machinist and helper and two or three laborers.

A list of gates of the same size is made up at the



Housed steel gears replace exposed cast-iron operating mechanisms on large Detroit valves

Portable air-driven milling cutter makes new keyway on valve stem.

office following one line of pipe. The crew installs new housings following this list. When the program is complete every gear-operated gate in the system will have its mechanism inside a housing and running in oil.

◆

Decorative Treatment of Track-Elevation Bridges

FOR a pleasing appearance of bridges on the track-elevation work of the Norfolk & Western Railway, at Columbus, Ohio (*Engineering News-Record,* Aug. 20, 1931, p. 284), special designs and treatment were worked out under the cooperation of R. H. Simpson, city engineer, and W. P. Wiltsee, chief engineer of the railroad. Both the steel and concrete bridges are used. Their treatment includes masking the steel or concrete structural work with concrete fascia girders, building abutments of architectural design, relieving the concrete surfaces by means of bush-hammered panels, large vertical grooves or chases in the abutments and wing walls, with smaller horizontal grooving and the name of the railway in large recessed letters in the fascia girders. A typical example is shown in Fig. 1, with details in Fig. 2.

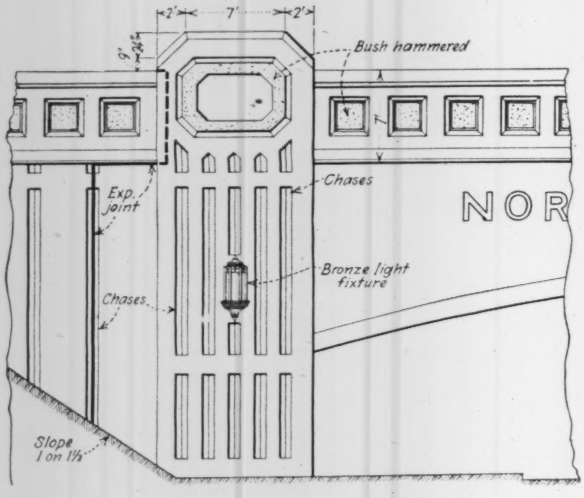


Fig. 1—Concrete masking of steel bridge

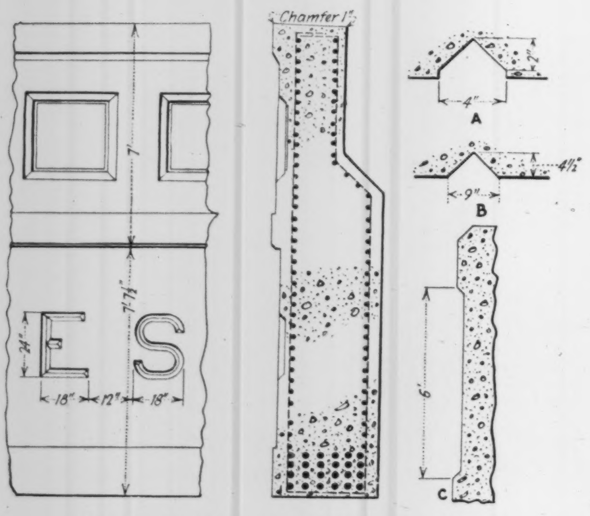


Fig. 2—Lettering and grooving of concrete

A, groove for letters. *B*, groove for vertical chases. *C*, section of panels in heads of pedestals.

In the concrete work a finish of exposed surfaces was effected by the use of fine aggregate and by grinding the face immediately after removal of the forms. All corners have a 1-in. chamber. For the grooves and letters the forms were of wood and steel nailed to the main forms. The vertical chases are V-section grooves 4½ in. deep and 9 in. wide, spaced 24 in. c. to c. The letters, 24 in. high, are formed by grooves 4 in. wide, with sides parallel for ½ in. and then sloping inward in V-shape, giving a total depth of 2½ in. Where inserts are used they are of black and tan glazed tile 1¼ in. thick, grouted into 1¼-in. recesses formed in the concrete. Lighter grooving, used in certain cases and somewhat resembling masonry joints, is made with V-grooves 1 in. deep and 2 in. wide.

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Care in Sewer Jointing Reduces Groundwater Infiltration

By EMERSON C. HALLOCK

Chief Inspector, Westchester County Sanitary Sewer Commission White Plains, N. Y.

INFILTRATION into the Mamaroneck trunk-line sewer system, built by the Westchester County, N. Y., sanitary sewer commission, was so much smaller than the allowable figure that the sewer will care for many thousand more people than it was originally designed for. The total leakage into 89,000 ft. of reinforced-concrete and cast-iron pipe, as measured after construction was completed, was only 86,000 gal. per day, as compared with the specification allowance of more than 725,000 gal. per day.

The trunk lines, for the most part, follow streams closely and are lower in elevation than the stream bottoms so that connections can be made from either side. Practically the entire line was below groundwater level. About 66,000 ft. of pipe was of reinforced precast concrete in 8-ft. lengths, varying from 24 to 66 in. in diameter. The remaining 23,000 ft. was of cast-iron pipe with diameters from 14 to 24 in. and 12-ft. lengths. The concrete pipe was laid on a concrete cradle, beneath which was a crushed-stone and vitrified-tile underdrain. The cast-iron pipe was laid directly on crushed stone with a vitrified-tile underdrain. For testing, a 4-ft. internal head was placed on all concrete pipe before backfilling. The iron pipe was subjected to a 40-lb. air test.

Joining procedure on the concrete pipe was as follows: (1) A composition of asphalt and asbestos was placed in the sleeve end of the pipe, which was in the trench; (2) a thick continuous strand of jute was packed into this compound; (3) the spigot end of the next length was inserted into this bell and shoved home, forcing the jute and sewer compound into the groove of the sleeve end; (4) more jute was calked into the joint when needed; (5) the remainder of the joint was filled tight from the inside with a 1:1 mortar; (6) a piece of burlap was placed around the outside of the joint, which was then poured with a thin grout. To prevent settlement after the joints were made up, the concrete cradle was placed before making up the joints. Tar paper placed a foot or so above the pipe protected it from the direct sunlight.

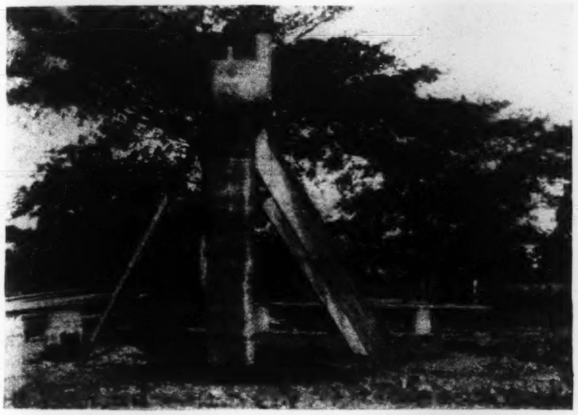
The Mamaroneck system was designed by W. W. Young, consulting engineer.

* * *

Simplified Bridge Abutment Contains Small Quantity of Concrete

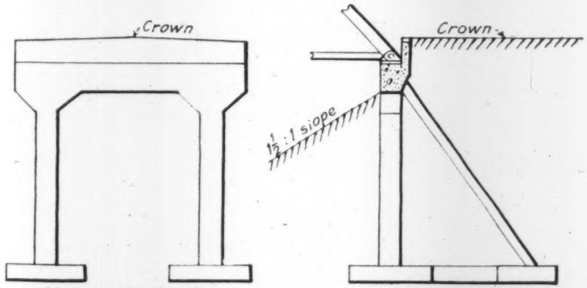
By ROY C. HARDMAN
Fort Lauderdale, Fla.

THE SKELETON abutment illustrated was developed by the writer a few years ago for use in the Republic of Panama, where a highway program was under way involving the construction with limited funds of a large number of important bridges. Of even greater significance, however, was the fact that a number of the bridges were to be built in a section where stone for concrete could only be secured from boulders in the streams, which were mostly at the bottom of gorges. It was, therefore, imperative to keep the volume of concrete to a minimum.

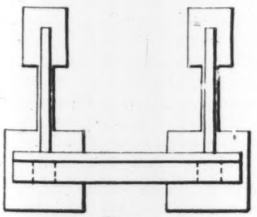


Completed abutment ready for fill

As the illustrations show, the abutment is a rigid two-column bent with tie members extending to the footings. It was designed for all usual loads, including wind reactions on the trusses and, in some cases, water pressure against the legs in times of flood. Negative pressure from that part of the fill running through the legs was not considered. Where there was a possibility of washing at the end of the fill, protection was afforded by slope paving or riprap, or by a thin curtain wall between the legs and cantilever wings parallel to the current. These were not tied to a foundation but extended only to a depth varying to suit local conditions, often just below the original ground level.



Stream Side Elevation **Section on C.L.**



Plan

Design details of skeleton bridge abutment

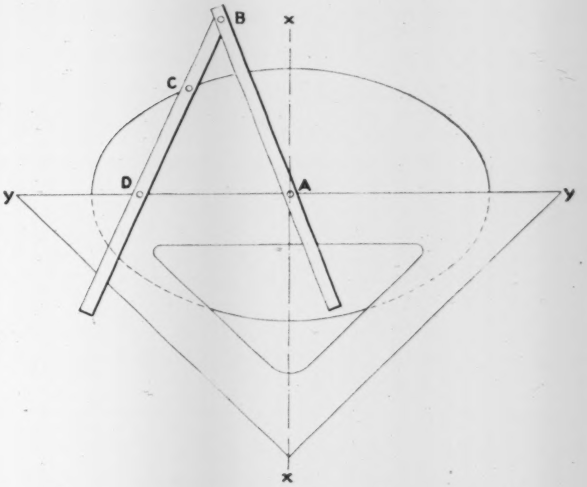
The first abutment of this type, erected in a low-land district where there were eleven major structures in 9 miles, contained but 20 cu.yd. of concrete, as compared with 242 cu.yd. for a gravity-type abutment of the same height.

* * *

A Simple Ellipsograph

By J. MAUGHS BROWN
Professor of Civil Engineering, University of South Dakota, Vermillion, S. D.

FOR quickly drawing an accurate ellipse a draftsman can make a very satisfactory ellipsograph with two thin strips of soft wood, a few thumb tacks and a pin or point for centering. These are assembled as shown in the illustration. Fasten the strips together at *B* with a large thumb tack, which acts as a hinge. With *a* and *b* equal to half of the major and minor diameters, respectively, of the ellipse, measure the distance $\frac{1}{2}(a + b)$ from *B* along each strip to determine points *A* and *D*. Through *A* run a needle, pin or other point at the intersection of the *x* and *y* axes, already laid out on the drawing. Pass a thumb tack through point *D* and round the point so that it will slide along the drawing without catching. Finally, make a hole at *C* just large enough to take a pencil lead or a stylus-type penpoint, making the distance *CB* equal to $\frac{1}{2}(a - b)$.



Method of drawing an ellipse

To trace one-half the ellipse, place a straight-edge against the center pin *A*, parallel to the major axis. Move the thumb tack *D* along this axis, at the same time exerting enough pressure at *C* to make a mark on the drawing. Then reverse the straight-edge to complete the figure. There will be two small gaps near the x–x axis that cannot be drawn because of interference between the strips; these can be closed in with an irregular curve. The strips can be re-used for drawing other ellipses until they are too full of holes to be serviceable.

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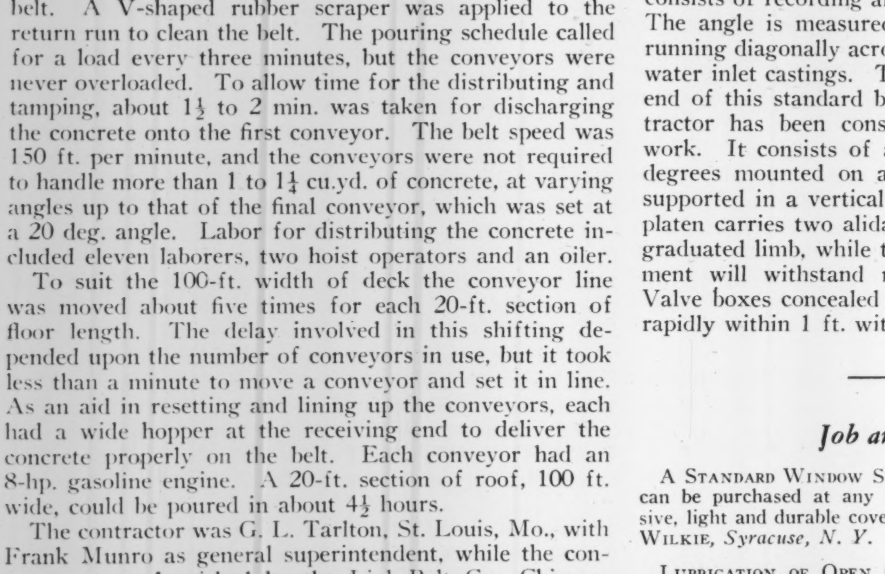
Portable Conveyors Place Concrete for Subway Roof

A SUBWAY under High St., St. Louis, Mo., requiring a roof 100 ft. wide and 2,200 ft. long that also forms the street slab, is a part of the new facilities of the Illinois Terminal Railroad (*ENR*, May 21, 1931, p. 857). Portable conveyors were selected for placing the concrete as requiring the least expense for preparation. This 10-in. slab, with about $5\frac{1}{2}$ cu.yd. of concrete and 700 lb. of reinforcing steel per foot of length (100 ft. wide), aggregates 12,000 cu.yd. and was poured in 20-ft. sections. A 1:2:4 concrete mix having 4- to 5-in. slump was delivered from a central mixing plant in motor trucks with bodies of 2.1-cu.yd. capacity.

The plan of pouring was to advance in 20-ft. sections; at times there were eight conveyors in series, giving a total length of a little more than 200 ft. Each conveyor was 26 ft. long, c. to c. of end rolls, and had a 24-in. belt. A V-shaped rubber scraper was applied to the return run to clean the belt. The pouring schedule called for a load every three minutes, but the conveyors were never overloaded. To allow time for the distributing and tamping, about $1\frac{1}{2}$ to 2 min. was taken for discharging the concrete onto the first conveyor. The belt speed was 150 ft. per minute, and the conveyors were not required to handle more than 1 to $1\frac{1}{4}$ cu.yd. of concrete, at varying angles up to that of the final conveyor, which was set at a 20 deg. angle. Labor for distributing the concrete included eleven laborers, two hoist operators and an oiler.

To suit the 100-ft. width of deck the conveyor line was moved about five times for each 20-ft. section of floor length. The delay involved in this shifting depended upon the number of conveyors in use, but it took less than a minute to move a conveyor and set it in line. As an aid in resetting and lining up the conveyors, each had a wide hopper at the receiving end to deliver the concrete properly on the belt. Each conveyor had an 8-hp. gasoline engine. A 20-ft. section of roof, 100 ft. wide, could be poured in about $4\frac{1}{2}$ hours.

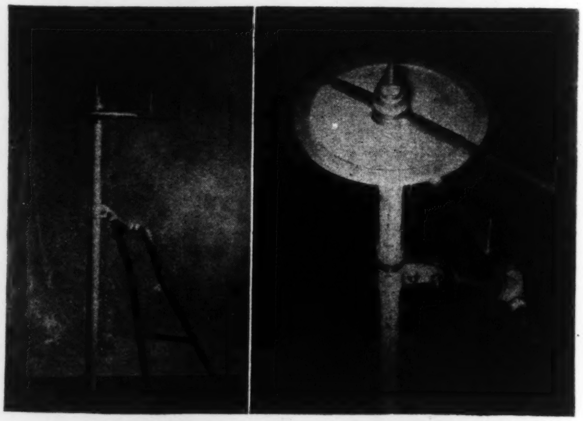
The contractor was G. L. Tarlton, St. Louis, Mo., with Frank Munro as general superintendent, while the conveyors were furnished by the Link-Belt Co., Chicago. The firm of Merker & Company, St. Louis, was the supervising engineer.



Conveyors in series handle concrete for 100-ft. slab

Referencing Valve Locations in Streets by Angle and Distance

SHEBOYGAN, WIS., has just completed re-referencing all the valve locations in the city's streets. According to A. H. Miller, waterworks superintendent, in a paper presented to the Wisconsin section of the American Waterworks Association, the new method consists of recording an angular deviation and a distance. The angle is measured from a standard reference line running diagonally across the intersection between storm-water inlet castings. The distance is measured from one end of this standard base line. A rugged sighting protractor has been constructed to facilitate the location work. It consists of an aluminum platen graduated in degrees mounted on a section of black pipe, which is supported in a vertical position by a pipe bracket. The platen carries two alidades, one of which is fixed to the graduated limb, while the other is movable. The instrument will withstand rough handling without damage. Valve boxes concealed under snow or ice can be located rapidly within 1 ft. with this instrument.



Instrument for locating valve boxes

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Job and Office Notes

A STANDARD WINDOW SHADE, 36 in. wide and 6 ft. long, which can be purchased at any 5- and 10c. store, makes an inexpensive, light and durable cover for the drawing board.—CHARLES B. WILKIE, *Syracuse, N. Y.*

LUBRICATION OF OPEN GEARS, such as are found on cranes, excavators and other machinery, can be facilitated by the use of a homemade mixture prepared according to the following formula: white lead, ½ lb.; cylinder oil, ½ gal.; flake graphite, ½ lb. The graphite and oil form the lubricating content of this mixture, while the white lead acts as a binder and keeps the gears from cutting. It will be found that this lubricant adheres well to gears and can be painted on with a brush. To vary its consistency cup grease may be substituted for the cylinder oil, or the graphite may be omitted. In warm weather the mixture may be made heavier by using less oil or grease in proportion to the quantity of flake graphite.—G. H. OLSON, *manager, crane and shovel division, Link-Belt Co., Chicago, Ill.*

LETTERS TO THE EDITOR

Engineering Work Preserved for Posterity

Sir—In *Engineering News-Record* for Nov. 5 there appears an editorial entitled, "Engineering Antiques," which opens with the sentence, "If engineering structures were not so big and cumbersome, some one could earn the grateful thanks of the profession as well as everlasting fame by founding a museum for engineering antiques."

Such a museum has been founded and it is known as the Museum of Science and Industry, founded by Julius Rosenwald in Chicago. The editorial mentions the old Home Life Insurance Building in Chicago, among other relics. Two weeks ago the museum accepted as a gift from the Marshall Field estate a section of the Home Insurance Building, consisting of a whole bay 17 ft. square, and is preparing to install this bay in that section of the museum building which will be devoted to tracing the evolution of buildings from primitive times to the present.

Despite its 580,000 sq.ft. of floor space, the museum cannot comply with the suggestion made in the editorial that full-sized bridges be placed on view. However, the complete history of bridges will be shown by means of scale models, many of which have been completed and are now in storage awaiting the completion of the museum's $6,000,000 home in Jackson Park, Chicago.

To make glad the heart of the locomotive engineer, let me say that a full-sized model of Stephenson's "Rocket" was opened yesterday at our warehouse—an exact replica built by the original firm of Robert Stephenson & Co. at Darlington, England. Eight other full-sized locomotives and many smaller-scale models will also be on exhibition—one of them cut open to reveal its operation and so equipped that the visitor may put it in motion by merely pressing a convenient button. The Pullman Co. has presented a full-sized Pullman car, which will be 100 years "long" and through which visitors may walk. The first compartment will be a replica of the early sleeping cars, with oil lamps and little better than boards on which to recline. This compartment will be mechanically shaken to give all of the realistic thrills of riding over the poorly ballasted rails of the 18th century. Other compartments will mark progress. The contributions of the engineer to other forms of land, water and air transportation will be handled in like manner.

Lest this letter reach the proportions of our museum (9 miles of exhibits under one roof and most of them working), I will hurry over some of the other sections. In interpreting the machine age the museum begins with a series of exhibits in physics and chemistry, because they are the basic sciences upon which all of our machines have been built. Then you will pass into a full-sized coal mine and a metal mine, where you will see the raw materials wrested from the earth; and then you will follow them through metallurgy until they are fashioned into machine tools. Next comes agriculture and forestry (orphans in most museums) and then motive power (we just moved a great Corliss engine from the Alexian Brothers Hospital in Chicago), which will trace the rise of the steam engine and the dynamo after introducing muscle, wind and water power.

Transportation and communication follow motive power, and we wind up with civil engineering and public works.

Mr. Julius Rosenwald started the Museum of Science and Industry with an initial gift of $3,000,000, and the people of this city have contributed $5,000,000 toward the reconstruction of the building. Many of the leading corporations of the United States have come forward with offers of donations in the form of money, models, replicas and original pieces of epoch-making machinery. When Oscar von Miller built the Deutsches Museum, in Munich, he not only received the fullest cooperation from the German government and the German industries, but the very material and labor with which his marvelous museum is built was cheerfully given.

Since *Engineering News-Record* has a kindred interest, I take the liberty of asking you to publish this letter in the hope that it may imbue engineers and engineering corporations with some of the enthusiasm for our project that has been manifested by our benefactors in the past two years. The exterior of the building has been recently completed, and work on the interior is about to begin. In another year the hope of the editorial staff of the *Record* will be fulfilled, and a new Engineering News Record in three-dimensional form will incite present and future generations to soar to new heights in achievement.

John A. Maloney,
Assistant to the Director,
Museum of Science and Industry.

Chicago, Ill.,
Nov. 13, 1931.

Railway Electrification Would Help

Sir—Permit me to express my gratification for the article by Lewis L. Baxter in your issue of Nov. 12, 1931, entitled, "Ten Billions a Year Wasted."

In my opinion, Mr. Baxter is right in his premises and in his conclusions, and I hope that his views will find the editorial support of your paper as well as the support of every individual and organization able to help along in the good cause.

Some time ago I suggested that one of the most effective ways of advancing industrial activity in the United States would be that of setting in motion the work of electrifying a substantial mileage of the railroads of the country. This I conceive to be one undertaking that would produce the needed stimulation to many of our sick industries, and which also, when carried out, would bring about an immense improvement in our transportation system and in the life of the country as a whole.

I fully realize the inability of the railroads to undertake this gigantic task under existing conditions and the probability that federal help will have to be employed in carrying out even preliminary work, but at that I can see nothing to prevent a comprehensive study of the problem at the present time, preparatory to a formulation of a detailed program of operation to be carried out over a number of years. This portion of the work alone would employ thousands of engineers and would lay the foundations for the next step, which would be the actual execution of the undertaking according to a definite program. In my opinion, the railroads of the United States require, among other things, a dramatic and fundamental reconstruction, so as to be brought up to date in such a way as to meet the mental concept of the modern man who thinks in terms of electricity and electrical appliances and devices, and not in terms of steam and other apparently old-fashioned methods of operation, no matter how good and how economical they may happen to be.

At the rate we are now moving, most of the people alive in the United States at the present moment will be a long time dead before railroad electrification, even on a limited scale, will have taken place. This is a great pity, as the job could be done now and some of us would live to enjoy its benefits.

Joshua D'Esposito,
Consulting Engineer.

Chicago, Ill.,
Nov. 17, 1931.

Aid Employment by Loans to Railroads

Sir—To alleviate the effect of the depression, the various public agencies from the federal government down to the village corporation have launched a program to supply employment to the millions of the unfortunate unemployed in this country. While this is a laudable end, the means, in my opinion, are all wrong in principle for various reasons, which I shall state after giving what I consider a constructive alternative suggestion. That suggestion is that the various agencies of government—federal, state, county and municipal—loan money at low rates of interest to the various public utility corporations now in bad straits financially and in need of funds for improvements and high-grade maintenance. A notable example is the railroad, the revenue of which depends in great part on its ability to supply the public with a smooth roadbed and the most modern equipment to lure the public away from the competing bus lines. As the Interstate Commerce Commission stated in its recent rate decision, the railroads are the backbone of this country, and when the backbone is broken and fails the structure is practically worthless. As a precedent to this proposal we need only cite the $300,000,000 appropriation for this purpose voted by New York State to finance grade-crossing elimination, which, however, was chiefly used in the boom years. Former government loans to railroads may also be cited.

Public works or improvements, while always a blessing, are not unmixed blessings, because they result in increased taxation, which will be one of the results of the present move. This burden is in the last analysis passed down to the very people who are to be aided by such work. In contradistinction the money loaned to, say the railroads, would result in the same or greater amount of employment, would, instead of resulting in increased taxation, result in revenue to the government or its subdivision in the form of interest. In addition, whereas the improvements undertaken by government agencies are tax-free and thus result in no contribution toward the expense of running the government, those constructed by private agencies result in revenue to the government in the form of taxes. In the case of the railroad these taxes are contributed to the federal, state and municipal coffers individually in several forms, so that collectively they form a very notable contribution toward the cost of government operation. An additional argument might be made in the fact that due to the absence of red tape in the management of funds for semi-private enterprises, more employment would result from the expenditure of the same amount of money and more construction would be completed than would result from government expenditure.

M. HIRSCHTHAL,
Concrete Engineer,
D. L. & W. Railway.

New York, N. Y.,
Nov. 9, 1931.

Landslides and Pile Action

Sir—The published letters of M. M. O'Shaughnessy (*ENR*, Aug. 27, 1931, p. 347) and Jacob Feld (*ENR*, Oct. 1, 1931, p. 540), as well as personal letters that I have received, are proof of the interest in the phenomena discussed in your issue of July 16, p. 93.

The revolving action of the slide at the Olympic Club, San Francisco, reported by Mr. O'Shaughnessy, may possibly be explained by plastic flow of the soil. At a certain depth the soil may be compared to a jelly-like mass that is stopped by the jetties in its downward movement and is forced to flow up the slope. This would be the case with any very viscous liquid under head and carrying a harder crust. It should be noted, however, that the revolving action of slides has been already observed on various occasions. For instance, sliding in the harbor of Gotenburg, Sweden, in 1916 resulted in the lifting of the sea bottom 150 or 200 ft. away from the place of the catastrophe [Fellenius: "Erdstatische Berechnungen mit Reibung und Kohäsion"—Berlin, 1927]. The appearance of a dome-like bulge in a garden close to a new highway fill was reported a few years ago in southwestern Pennsylvania [Ladd: "Landslides and Their Relation to Highways (Part II)"—*Public Roads,* Oct., 1928]. The cause was an earth slip provoked by the additional weight of a fill on an old slide. Several examples of revolving action on a smaller scale have been observed on Swedish railroads ["Statens Järnvagärs Geotekniska Kommission, 1914-1922"—Stockholm; and Terzaghi; "Mechanics of Shear Failures on Clay Slopes"—*Public Roads,* Dec., 1929]. The overcoming of the passive resistance of the earth, occasionally combined with plastic flow and accompanied by a displacement of the prism of passive thrust, may be one of the explanations.

Mr. Feld affirms categorically that the results of different investigations indicate that the sliding curve tends to be circular although there "is no proof further than deduction from cracks at the top and bottom of actual slides." Actually, attempts have been made to develop the equation of the sliding curve by Resal ["Poussée des Terres (Part II)"—Paris, 1910], Frontard ["Cycloïdes des Glissements des Terres"; "Logoïdes des Glissements des Terres"—Comptes Rendus de l'Académie des Sciences, Paris, 1922] and by others who developed, for the sliding curve, equations differing from the circle. In recent times not only have observations of cracks on the tops and bottoms of slides been made, but also comprehensive surveys of the sliding surfaces as a whole. Suc surveys began in Sweden, where the Swedish geotechnic commission studied slides that actually took place in railroa cuts. Swedish engineers empirically adopted the circula shape of the sliding curve. A comprehensive and highl scientific discussion of different theoretical and empirica methods of establishing the shape of the sliding curve is give by Terzaghi in the reference already cited.

I am glad to hear that road cuts in West Virginia hav been held in place by piles; this is a practical proof of m theoretical considerations. Theory in technology often come after practice; but, once established, it helps to develop prac tical initiative. Other interesting examples cited by Mr. Fel are chiefly results of such intuitional engineering. A com prehensive theory explaining the behavior of piles and soi in such cases is missing, revealing a blank spot in soil mechanics. There are several theories, but all need furthe study.

In 1928 I did some experimental work on piles [Krynin and Laletine: "On the Action of a Horizontal Force on a Vertical Pile"—Moscow, 1930 (in Russian)]. Wooden pile of 3 to 3½-in. diameter, ranging in length from 6 to 7½ ft., were driven into a very uniform clay with 17 to 18 per cen of natural moisture. Then the piles were overturned b applying a horizontal force. The zero point was located at a depth of 0.52*h* to 0.69*h,* averaging close to 2/3*h.* Th critical depth of driving was 20 in. for one clay and 22 in. for another; when driven more deeply, the piles broke with out pushing out an earth cone, as is the case in shallowe driving. The piles always broke 4 in. below the earth sur face. Recently at Yale I took advantage of the property o such piles to turn about a zero point in designing a stak method for determining the shearing resistance of the nat ural soil, particularly the shearing resistance of the highwa subgrade. This method has not yet been published.

DIMITRI P. KRYNINE,
Research Associate in Soil Mechanics,
Yale University.

New Haven, Conn.,
Oct. 27, 1931.

How Real Is Professional Solidarity?

Sir—I had just finished writing my 1,338th letter of application for employment when my attention was directed to your editorial "Professional Solidarity Made Real" in the No. 12 issue of *Engineering News-Record.* In particular I noted the latter part of the second last paragraph, which runs as follows:

> In administering the work all distinctions as to society membership disappear. All are engineers, be they members of the civil, mechanical, electrical or mining corps, or members of none of the directing engineering organizations. A man needs but to show that he is an engineer to get help. Here is professional solidarity at its best. As is so often the case, adversity has shown the way toward developing the strength of united action.

As one of the unlucky ones mentioned in your editorial (and doubly unlucky because of non-membership in any of the engineering societies), I wish to call your attention to the kindness and spirit of friendliness with which I was received by C. M. Boyé and Dr. Browne of the Engineering Societies' employment bureau upon the occasion of my trip East in search of employment. Here in Chicago matters would appear to be different, for when I called on the Engineering Societies' employment service, 205 W. Wacker Drive (and I presume this is a branch of the New York organization), I was told my application could not be filed since I was not a member. I have no kick coming in that respect since I am not a member of any of the engineering societies, but the thought occurred to me that your paragraph is scarcely applicable as far as the Chicago branch is concerned.

My morale is still unimpaired, as you may judge from the number of letters I have written in search of that very elusive wil o' the wisp, but I am wondering regarding the reactions of others who may have read your very commendable editorial and experienced the same chilly reception at the Societies' Bureau in Chicago.

WILLIAM STACK.

Park Ridge, Ill.,
Nov. 18, 1931.

NEWS OF THE WEEK

Drought in Southeast Somewhat Relieved by Showers

Superficial relief from drought conditions in the Southeast (see *ENR*, Nov. 19, p. 817) was afforded last week by precipitation ranging from fairly heavy in the lower Mississippi Valley to gentle showers east of the mountains, but in areas where the large hydro developments are located no benefit resulted beyond momentary checking of the drop in the rate of streamflow. Reports from several sources state that power companies are increasing their steam plant use, expecting further water shortage, since heavy rains usually do not begin until several weeks later in the season.

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Chicago Opens New Airport

The Chicago municipal airport, at 63d St. and Cicero Ave., was opened Nov. 15, with appropriate ceremonies, by Mayor Cermak and Major Landis, chairman of the Illinois aeronautic commission, the airport receiving the first state license issued by the commission. The cost was $770,000, including $100,000 for the passenger station.

◆

Work Curtailed on Montreal Railway Terminal

Work on the new terminal for the Canadian National Railway in Montreal has been curtailed on account of the serious decrease in the railway revenues. Only work on those parts of the project which have reached the stage where work cannot be stopped immediately is to be carried on.

The terminal reconstruction was begun about a year ago. It calls for the construction of a large passenger terminal in the center of the city and the reconstruction of existing terminals and their approaches within the city, largely for the elimination of grade crossings by track elevation.

◆

Prominent Army Engineer Officers to Change Stations

Retirement of Col. Herbert Deakyne, member of the board of engineers for rivers and harbors, from active service Dec. 31, is to bring changes in the stations of a number of other prominent army engineer officers. Col. William J. Barden, engineer, Second Corps Area, and division engineer of the North Atlantic Division, with headquarters at New York, is to go to Washington, presumably to succeed Col. Deakyne on the rivers and harbors board. Col. George M. Hoffman, now engineer of the First New York District, is to succeed Col. Barden as engineer of the North Atlantic Division, and Col. William C. Weeks, now engineer of the First Chicago District, comes to New York to succeed Col. Barden as engineer of the Second Corps Area, Col. Barden having heretofore filled both positions. Lieut. Col. Daniel I. Sultan, now on duty in Washington following the completion of the Nicaragua Canal survey, will go to Chicago to succeed Col. Weeks.

The orders making the changes are to become effective on Jan. 1. Major B. C. Dunn, who has been in charge of the finance division in Washington, has been appointed district engineer at Jacksonville. Major J. F. Bragdon, who is returning from foreign service, has been assigned to duty in the office of the Chief of Engineers. The duties of district engineer at Wilmington have been taken over by Col. I. L. Brown in addition to his duties as district engineer at Philadelphia. He relieves Col. R. P. Howell, who has been assigned to the Sixth Engineers at Fort Lorton, Wash.

Contract Awarded for Albany-Rensselaer Bridge

The board of public works of the State of New York has awarded to Booth & Flinn, Pittsburgh, Pa., the contract for construction of a bridge between Albany and Rensselaer and removal of grade crossings that will be necessary. The successful bid was for $2,490,023, the lowest of thirteen submitted, and is more than one million dollars lower than the estimate of the engineers. Work on the abutments of the new bridge will be started on both sides of the river this winter.

◆

Indiana Plans Winter Road Work on Short-Day Basis

Contractors for paving and bridges on the 1932 projects of the Indiana state highway department are asked to limit working schedules to a maximum of nine hours per day and 54 hours per week, in order to spread work among a larger working force. To increase the amount of work this winter contracts are being let earlier than usual, with the first letting on Nov. 24 for 90 miles of paving at a total cost of $2,000,000. Bids are to be based on the working hours noted above. Contractors will be urged to do as much work as possible during the winter, and it is pointed out that, while paving surface cannot be laid in freezing weather, work can be done on excavation and culvert construction.

Maintenance work will also be increased, according to a statement by the chairman of the highway commission, nearly 1,000 miles of local roads having been absorbed into the state system within the past twelve months, making the total of this system about 7,000 miles, or 10 per cent of the road mileage

MONUMENTAL BRIDGE RECENTLY COMPLETED IN HOLLAND

This steel arch bridge with concrete arch approaches was recently opened at Katerveer, Holland. The main span, a 448-ft. parabolic steel arch, is composed of two trusses spaced 29 ft. on centers. The bridge was designed by J. P. Walland, chief engineer of the Rykswaterstaat, Den Haag, and was built by the Hollandsche Beton Maatschappy.

of the state. The maintenance division has now about 1,300 men classed as relief workers, while its regular force has been increased by several hundred men with the reduction of its working day from nine to eight hours. Such work consists principally of hand labor for widening surfaces, dressing them with stone or gravel, mowing weeds and opening ditches. This winter demand for material is expected to react in increasing the forces of quarry and gravel-pit operators.

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Philadelphia Engineers Discuss Planned Public Works

Advance planing of public-works construction as a means of stabilizing employment was the theme of a meeting held by the Philadelphia Section, American Society of Civil Engineers, on Nov. 19. William N. Loucks, of the Wharton School of Finance and Commerce, University of Pennsylvania, gave the results of a study indicating that Philadelphia spends annually $35,000,000 to $40,000,000 on permanent public improvements, half of which could be deferred until a period of business depression, thus absorbing about 10 per cent of those ordinarily unemployed at such a time. He also pointed out the need of a long-term financial program to make such stabilization possible, a subject that was elaborated upon by D. H. Sawyer, director of the federal employment stabilization board.

◆

Hoover Dam Notes

Work at Hoover Dam has expanded to the extent that an additional 200 men have been employed, bringing the total labor force to 2,900. Housing accommodations and feeding facilities have been improved to the point where the working force is now relatively well provided for.

The federal court has granted an injunction against the State of Nevada from enforcing its requirement prohibiting the use of internal combustion engines in the diversion tunnels at distances more than 250 ft. from the portals. It is contended the state does not have jurisdiction over the federal reservation. The Nevada order was aimed at the practice of Six Companies in running trucks direct to the mucking shovels in the enlargement of the headings.

Work has been started on the 41x56-ft. enlarged headings at the inlets of tunnels Nos. 2 and 3. During the week ended Nov. 14 a total of 276 lin.ft. of enlarged heading was driven. The status of these headings is as follows: tunnel No. 2, 295 ft. from outlet; tunnel No. 3, 390 ft. from outlet; tunnel No. 4, 520 ft. from outlet and 35 ft. from inlet. Out of a total of 16,000 ft. of 12x12-ft. pioneer tunnels (top headings) but 3,300 ft. remains to be driven. Pioneer tunnels have been holed through from portal to portal in tunnel No. 3 and lack but 130 ft. of holing through in tunnel No. 2.

Vocational Schools for Builders

Better facilities for vocational education in the building trades were advocated on Nov. 20 before the New York Building Congress by William E. Grady and F. J. Keller, of the New York school system. A central trade school, Mr. Grady said, had been set up in an old building, but soon had to vacate because the building was condemned by the fire department. Adequate quarters are necessary for apprentice training, and extension of the work to foreman and superintendent training may be desirable. Efforts to bring such improvement about must come from the industry itself. Mr. Keller pointed out the importance of "market" study for determining the amount and kind of facilities necessary. Vocational training has made more progress in the printing and textile fields than in building, due to more interest from the industries.

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Texas Motor Truck Law Is Declared Constitutional

The constitutionality of the law regulating motor truck transportation in Texas has been upheld by the federal court at Houston, and the motor truck division of the railroad commission is endeavoring to bring about a strict observance of the new orders and rules governing such vehicles. The law, which fixes the net weight load of motor trucks at 7,000 lb. and places a limit of one trailer to each truck, will go into effect on Jan. 1.

Complaint has been made by people in various parts of the state not only that the operation of motor trucks upon the highways is a hazard to human life but that they are doing great damage to the improved roads. State Senator Gus Russek, of Schulenburg, urges that the legislature enact additional laws to regulate the operation of trucks as railroads are regulated. He points out that during the last few months there have been more than 200 fatalities in which motor trucks were involved.

Gibb Gilchrist, engineer for the state highway commission, says it is impossible to state definitely how much damage motor trucks have done and are doing to the highways. Upon some roads the damage has been heavy and on others no damage has been done. The amount of damage depends altogether upon the character of road construction. He said that some of the bridges are too light for the heavy trucks.

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Italy to Spend Nearly $8,000,000 for Public Works

A recent Italian government decree authorizes the expenditure of $7,890,000 during the fiscal year 1931-32 on the following special public works, which are deemed urgent: hydraulic development, $5,610,000; roads, $1,104,000; port works, $464,000; improving congested centers, $396,000; railways, $263,000; buildings, $53,000.

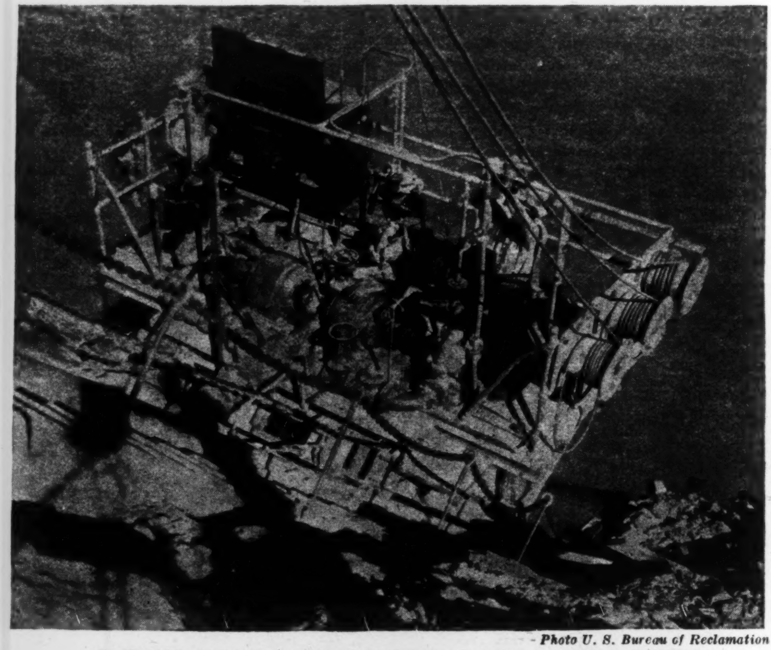


Photo U. S. Bureau of Reclamation

SLIDING INTAKE FOR BOULDER CITY'S WATER SUPPLY

Electrically driven pumping plant is mounted on platform which slides up and down inclined rails to meet varying river stages. Permanent header pipe, located between rails, has Y-connections at regular intervals for hooking to pump outlets. Platform is anchored to incline by hook bolts.

Columbia to Open Classes for Unemployed Engineers

Classes in the Engineering School of Columbia University have been opened to unemployed professional engineers in response to a proposal advanced by the Professional Engineers' Committee on Unemployment and the Gibson committee.

"The principal purpose for opening the classes without fee or credit to the engineers, "Dean Barker says, "is to preserve the morale of these skilled men during a period of enforced idleness. In the lectures they will hear rediscussed the principles of engineering which they covered while in college. Their minds will be refreshed on various aspects of engineering which they may have partly forgotten due to specialization in one particular phase of the profession. They will be of better service to the community when business revives, and meanwhile they will have the privilege of widening their horizons and increasing their contacts."

Applicants must obtain a certificate from the engineers' committee, of which H. deB. Parsons is chairman, showing that they are accredited members of the profession and that they are idle through no fault of their own. The number of the engineers admitted to the classes will be limited only by the size of the lecture halls.

Catalogs and class schedules have been sent to the committee, which has its headquarters in the Engineering Societies' Building, 29 West 39th St.

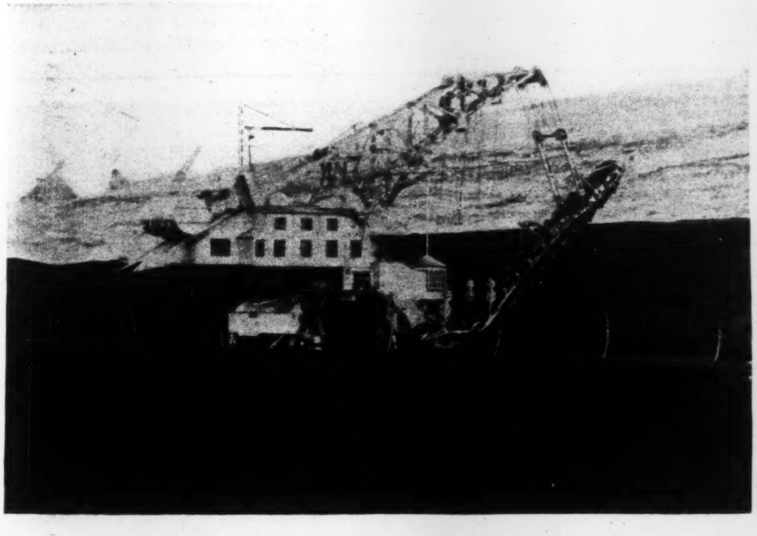
New Jersey Moves to Acquire High-Level Reservoir Site

Purchase of 8,000 acres of land along the South Branch of the Raritan River near Califon for use as a high-level reservoir serving the northern New Jersey metropolitan district has been recommended by the New Jersey State Water Policy Commission, which has requested the legislature to authorize the issue, for this purpose, of $4,800,000 of the $7,000,000 bonds voted in the 1930 election for conserving the water resources of the state.

The South Branch reservoir, according to the commission's report, would ultimately supply 165,000,000 gal. daily (165 m.g.d.) from a watershed aggregating 180 square miles, development to proceed in several stages. Water would be delivered to the boundary of the consuming district at an elevation of 400 ft. above sea level. Construction would involve a masonry dam 950 ft. long and 150 ft. above the river bed; diversion tunnels and aqueducts from near-by streams to the South Branch watershed; delivery aqueducts; an equalizing reservoir; and filtration works. An estimate based upon the development of 152 m.g.d. gives the total cost, including filters but not delivery mains beyond, of $37,305,000, or $245,000 per m.g.d. Construction would account for $21,222,000 of this amount.

The State Water Policy Commission does not have authority to construct the project; this would require concerted action by all the municipalities to be served, acting through an executive body such as the existing North Jersey District Water Supply Commission, which has recently completed the Wanaque project. The Water Policy Commission is, however, in charge of planning the unified development of the state's potential water-supply sources and is empowered to acquire lands and water rights in advance of immediate requirements.

Morris R. Sherrerd is chief engineer. His recommendations on the South Branch project have been studied and approved by a number of consulting engineers, including Frank A. Barbour, Boston; John H. Gregory, Baltimore; J. Waldo Smith, New York, and Carroll P. Bassett, Summit, N. J. Geological investigations have been made under the supervision of Charles P. Berkey, New York. Sanitary questions were referred to the firm of Weston & Sampson, Boston.



GIANT EXCAVATOR MINES LIGNITE

In Germany, where an important industry is the mining of lignite, which serves not only for heating and industrial purposes but also for electric power generation, the Maschinenfabrik Buckau R. Wolf A. G., of Magdeburg, and other concerns are using giant excavators to mine the coal. These excavators are about 75 ft. high and the dredges are about 50 ft. deep and 50 ft. high. The weight of the dredger is equally supported by 48 running wheels. The designed capacity of these machines is about 3,000 cu.yd. per hour, but in actual use the average lignite dug out is about 1,100 cu.yd. per hour. The machines are driven elecrtically and only two men are employed on each machine, reducing costs considerably.

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Supervision of Public Contractors Proposed in Illinois

Bills requiring the establishment of a uniform system of accounting of the expenditures of municipalities and contractors engaged in public work were introduced in the Illinois legislature on Nov. 11. The proposed legislation consists of two bills, one providing for a public expenditures commission for downstate, and the other creating a budget supervisory board for governmental units within Cook County.

The downstate body, to be known officially as the Public Expenditures Commission, is to receive annually full and correct copies of the accounts of municipal corporations and public contractors. As a penalty for a contractor's submitting erroneous or incomplete statements, the commission may order the compensation of the contractor withheld until corrections are made and proper accounts filed. In case of falsification of the records submitted by public officials the bill makes it the duty of the officers of the municipal corporation to prosecute suit for recovery of the funds involved. The commission is given the power to subpena records and accounts.

The proposed Budget Supervisory Board for Cook County would consist of three members appointed by the county judge. They would be barred from holding other public office during service on the board and for four years thereafter.

Both bills require a uniform system of accounting by municipalities and contractors doing public work.

The legislation is similar to that suggested by a resolution passed by the Chicago city council on March 18. That resolution petitioned the legislature to authorize just such administrative machinery in the city of Chicago for the purpose of alleviating what had been charged to be gross extravagance and misapplication of public funds in the letting and execution of public contracts.

Canada's Transportation Problems to Be Investigated

The Canadian government has appointed a royal commission with wide powers to inquire into the whole problem of transportation in the dominion. The commission consists of Lord Ashfield, of London, England; Lyman Poore Duff, of Ottawa; Sir Joseph Flavelle, of Toronto; Beaudry Leman, of Montreal; Leonor F. Loree, of New York; Walter Charles Murray, of Saskatoon, Sask., and John Clarence Webster, of Shediac, N. B. The functions of the commission are set forth in an order-in-council based on a report of the standing committee on railways of the House of Commons, which pointed out the serious condition resulting from the diminution of railway revenues brought about partly by the duplication of tracks and services and partly by the competition of motor vehicles on the highways.

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Contract Awarded for Hetch Hetchy Emergency Pipe Line

The contract for the emergency pipe line on the Hetch Hetchy project, to connect the west end of the San Joaquin Valley section, now under construction, with the supply system in operation across San Francisco Bay, has been awarded the Youdall Construction Co. on a low bid of $928,550 (*ENR*, July 30, p. 189).

The emergency line, to be known as the Corral Hollow route, will be a 45-m.g.d. pumping line over the Coast Range to bring Hetch Hetchy water to San Francisco ahead of the completion of the Coast Range tunnels now under construction on the Hetch Hetchy line. This route will use the easterly 4.4 miles of the Coast Range tunnel already completed. A pumping station in the tunnel at the end of this section will lift the water against a head of 540 ft. to the surface, where a second pumping station will raise the water against a head of 785 ft. to the summit of the ridge. The water will then flow through a pipe line, which will connect with the supply system in operation across San Francisco Bay. The total length of the emergency line is 25.9 miles. The contract requires that construction start immediately and be completed within 200 days. A bonus of $1,500 a day up to fifteen days for completion in less than 200 days is provided in the contract, as well as a penalty of the same amount for delay.

Construction is well advanced on the last two sections of the permanent Hetch Hetchy line. The San Joaquin pipe line is nearly 50 per cent completed. Twenty-four miles of trenching on the 47½-mile line has been completed and 14.5 miles of pipe laid. The Youdall Construction Co. holds the contract for this construction on a bid of $4,136,479 and began work in June. The contract calls for completion June 10, 1932.

Of the 28.5 miles of tunneling to be done on the Hetch Hetchy project, 21.5 miles has been driven and 5½ miles of this distance lined with concrete. All tunneling is expected to be completed in 1933.

In addition, the contract for the Red Mountain Bar siphon was let Oct. 28 to McDonald & Kahn, San Francisco, on a low bid of $174,359. This unit is the final connection in the foothill division of the Hetch Hetchy aqueduct. It is 9 ft. 6 in. in diameter and 1,700 ft. long.

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Flood Control Project Near Pasadena, Calif.

Preliminary steps in a flood-control project in Eaton Canyon, near Pasadena, Calif., which will include a 55-ft. earth-filled dam to impound 1,200 acre-ft. of water, have been taken by the Los Angeles County board of supervisors. The board has voted to thaw out a $530,000 frozen balance of a $600,000 bond issue voted in 1924 for the work. The money was released under a recent ruling of the California supreme court in the San Gabriel Canyon bond case, in which it was held that the funds of a bond issue could be diverted for a new project if conditions had changed and the intent of the original project is carried out.

E. C. Eaton, chief engineer of the Los Angeles County Flood-Control District, was instructed by the board to prepare plans immediately and to institute the necessary proceedings for acquiring the land necessary for the project. The original project called for a dam 210 ft. high impounding 1,033 acre-ft. The estimated cost of this project was about $1,000,000.

The new dam and flood-control work will be the first step in a regional park plan for Eaton canyon and wash involving about 1,000 acres.

Concrete River Wall to Protect Memphis Engineer Supply Depot

Approval of the plans has been received from the Chief of Engineers for the construction of a 1,800-ft. concrete river wall and levee to protect the U. S. engineer supply and repair department depot in Arkansas across the river from Memphis, and work on the wall will begin shortly. The wall will extend across the riverfront of the depot, and will be built on steel sheetpiling to be driven 30 ft. into the river bottom. The work will cost about $269,000 and is planned to protect the equipment of the depot from floods of any size.

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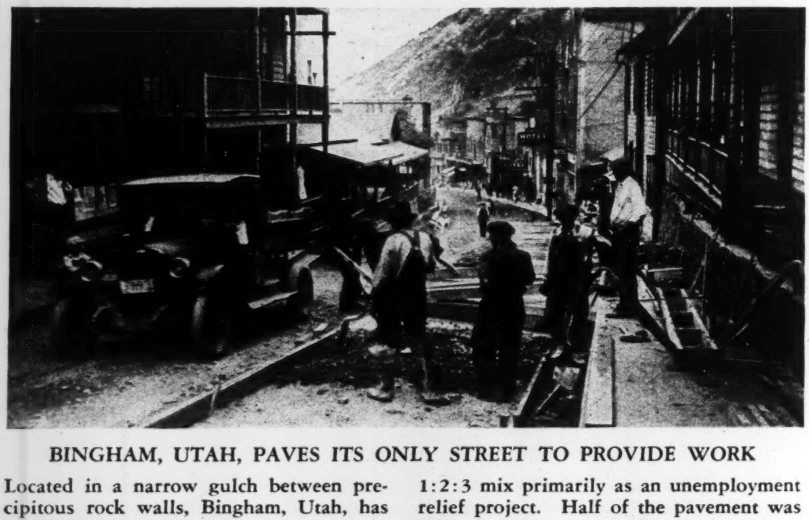
Calumet-Sag Canal Project Opposed by Railroads

Proposed enlargement of the Calumet River and the Sag channel (a branch of the Chicago drainage canal) as a navigable connection, south of Chicago, between Lake Michigan and the future Illinois waterway to the Mississippi, is opposed strongly in a report by a group of some 30 railroads. This new channel would intersect a large number of main lines and connections in a busy industrial region, necessitating extensive and costly track elevation and other railway works, besides numerous drawbridges. The Chicago River has been regarded as the natural approach to the waterway and it is claimed that this additional or bypass route is unnecessary. The report is based largely on the assumption that the waterway development in general is economically undesirable and that its traffic would be mainly freight taken from the railroads.



BINGHAM, UTAH, PAVES ITS ONLY STREET TO PROVIDE WORK

Located in a narrow gulch between precipitous rock walls, Bingham, Utah, has long been famous as a one-street town, although it has a normal population of 3,200. No paving had ever been laid, because of the grade of 4 to 15 per cent, the width of 13 to 40 ft. (20 ft. in the business section) and the impossibility of detouring traffic, until it was recently decided to lay a 6½-in. concrete slab of 1:2:3 mix primarily as an unemployment relief project. Half of the pavement was laid at a time in order that vehicles might still use the street. Work was given to 100 men for an average of nine days each. The concrete was mixed at a central plant. Mayor Flynn was in general charge of the project, with George Earle, of the Utah Copper Co., as acting city engineer.

Competition Announced for a Monument at Appomattox

Announcement is made by the war department of an architects' competition for a monument to be erected in Court House Square, Appomattox, Va., to commemorate the termination of the war between the states which was brought about by the surrender of the army under Gen. Lee to Gen. Grant and to honor those engaged in the conflict. It is stipulated that the monument commemorate the termination of the war and symbolize an undivided nation and a lasting peace. It is required that the designs submitted be accompanied by a landscape plan showing a proposed treatment of the court house tract and any proposed relocation of the highway which runs through it. Architects who are citizens of the United States are eligible to compete.

The author of the design selected by the jury will receive $2,300, for which he will be required to furnish additional preliminary drawings and an outline specification and to make such changes in his design as may be required to present the design properly for the consideration of Congress. When Congress appropriates the necessary funds for the monument, the winner will be commissioned as architect to prepare the working drawings and specifications for the construction, and to act as adviser and consultant architect during construction, for which he will be paid $2,700.

Further details of the competition may be obtained from the Quartermaster General, Construction Division, U. S. War Department, Washington, D. C.

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American Engineers to Report at International Railway Congress

A list of subjects for the railway congress to be held at Cairo, Egypt, in 1933 has been issued by the International Railway Congress Association, whose headquarters are at Brussels, Belgium. Separate reports on each of the thirteen subjects will be prepared by two or three members designated for this purpose, each report covering a certain group of countries.

In the following list are noted only the writers of the reports on groups including the railways of the United States; two of these are American railway engineers: (1) use of mechanical appliances in track maintenance and renewal, F. M. Thompson, district engineer, Missouri-Kansas-Texas Lines; (2) economic aspects of railway electrification, S. Withington, electrical engineer, New York, New Haven & Hartford R.R.; (3) protection of grade crossings in view of highway traffic developments, A. Newlands, chief engineer, London, Midland & Scottish Ry.; (4) relations between cars and track to insure safety at high speeds, S. Okhodo, director of maintenance, Government Railways of Japan; (5) increasing mileage of locomotives, Sir Henry Fowler, assistant to vice-president, London, Midland & Scottish Ry.; (6) metal rolling stock, H. N. Gresley, chief mechanical engineer, London & Northeastern Ry.; (7) distribution and interchange of rolling stock, F. H. van Rijckevorsel, Netherlands Railways; (8) less than car lot freight and mechanical handling of freight, M. Hauterre, manager, State Railways of France; (9) automatic train control, G. H. Crook, assistant signal engineer, Great Western Ry. (England); (10) improved organization of staff and forces, E. Soulez, chief engineer of operation, Northern Ry. (France); (11) competition of rail, road and air transport, E. C. Cox, traffic manager, Southern Ry. (England); (12) coordination of trunk lines and light railways, C. B. Chehata, director of freight traffic, Egyptian Railways; (13) rail motor cars on secondary lines, A. D. J. Forster, assistant commissioner, New South Wales Government Railways.

COSTS AND CONTRACTS

ENR Index Numbers

Cost			Volume		
Nov. 1,	**1931**	**169.28**	**Oct.,**	**1931**	**229**
Oct. 1,	1931	169.78	Sept.,	1931	225
Nov. 1,	1930	198.54	Oct.,	1930	211
Average,	1930	202.85	Average,	1930	260
Average,	1929	207.02	Average,	1929	317
1913		100.00	1913		100

This Week's Contracts

Heavy construction contracts, reported by *Engineering News-Record* in the week of Nov. 26, with some comparisons, total as follows:

(In Thousands of Dollars)

Buildings:	Nov. 26, 1931	Average of Last Four Weeks 1931	1930
Industrial	$2,630	$2,209	$5,100
Other	8,265	9,538	22,508
Streets and roads.	5,892	4,885	6,571
Other construction.	7,494	17,675	13,154
Total	$24,281	$34,308	$47,333

Total, all classes, Jan. 1 to Nov. 26:

1931	$2,327,522
1930	3,000,444

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Housing Shortage No Longer Acute in Germany

That the period of extensive dwelling construction in Germany which has been carried largely with government assistance is drawing to a close partly as a result of the financial stringency and partly because the urgent need for additional living accommodations no longer exists is evidenced by current German building statistics, according to Consul Lester L. Schnare at Hamburg. The figures show that the percentage of small dwellings (from one to three rooms) completed in Germany during the first half of 1931 increased to 53.6 per cent from 49.4 per cent in 1930, while the percentage of medium and large dwellings was reduced. The percentage of one-family houses fell from 27.3 per cent in 1930 to 22.4 per cent in 1931. German construction experts interpret these figures to indicate that the problem of housing shortage is being more than adequately met.

Allegheny County Not to Buy Wabash Bridge and Tunnels

Purchase of the Wabash bridge and tunnels for a new traffic artery to the South Hills section of Pittsburgh, for which the Allegheny county commissioners voted more than $4,200,000, has been rejected by the grand jury. This action nullifies the contract with the Pittsburgh & West Virginia R.R. entered into by the county commissioners for purchase of the bridge and tunnels at a cost of $3,000,000.

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Storage Begins at Safe Harbor

Filling the reservoir behind the 5,000-ft. concrete dam of the Safe Harbor, Pa., hydro-electric project on the Susquehanna River has been started, and it is expected that power production will begin before the first of next year. In order to avoid undue interference with the Holtwood and Conowingo plants, lower down on the stream, water will be accumulated at a relatively low rate, and it is possible that a release of stored water will be found advisable to meet peaks in power demand.

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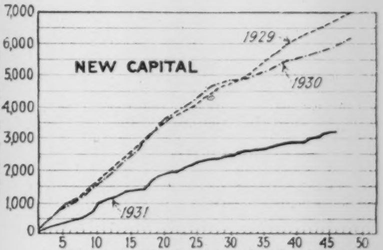
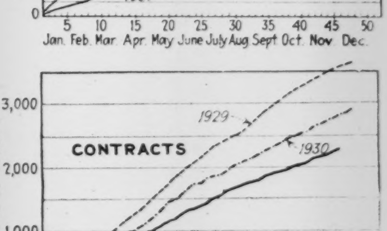
Capital and Contracts

Issues of new capital for the week ended Nov. 21 totaled $20,000,000, of which $15,000,000 were private and $5,000,000 public flotations. The weekly average for November thus far is $13,000,000, compared with $19,500,000 in October and $73,000,000 for November, 1930.

The principal issues of the week were: Cincinnati Union Terminal Co. 5s, $12,000,000, property acquisition and construction; State of Oregon 4¼s, $1,000,000; Ramsey County, Minn., 4¼s, $1,000,000, road and bridge bonds.

Construction financing in the period Jan. 1 to Nov. 21, inclusive, has reached a total of $3,165,000,000, compared with $5,731,000,000 in the corresponding part of 1930.





Brief News

A School Bond Issue of $3,500,000 was rejected by the voters of San Francisco, Calif., at the November election by a vote of 56,070 yes and 34,395 no, a two-thirds vote being necessary.

Receipts from operation of the St. Johns River toll bridge at Jacksonville, Fla., dropped to a new low level during October, when the daily average was $294.95.

Contract for construction of the $8,333,000 marble building which will house the U. S. supreme court has been let to the George A. Fuller Co., of Washington and New York. Three years is allowed for construction.

The Six-Hour Day without increase in the hourly scale of wages has been adopted by the Carpenters' and Joiners' Union, Local No. 180, Vallejo, Calif. The daily wage is reduced from $9 to $6.75.

Completion of southern California's largest high-pressure natural gas pipe line by the Southern Fuel Co. was announced Nov. 17 by Alexander B. Macbeth, president. The 26-in. carrier, extending 213 miles from the Kettleman Hills oilfields in Kern County to Long Beach, was built in seven months at a cost of about $6,500,000.

Erection of a Bridge across the South Saskatchewan River at Saskatoon has been approved by the dominion government of Canada as an unemployment relief measure. The bridge is estimated to cost about $850,000, of which the federal government will contribute $350,000, the provincial government $140,000 and the city of Saskatoon the remainder.

Plans and Specifications for a modern sewage-disposal plant for Dallas, Tex., have been submitted by Hawley, Freese & Nichols, Fort Worth, consulting engineers. The plans call for a disposal system of sufficient size to accommodate a city of 250,000 regularly and 450,000 as a peak load, which is estimated to cost $1,500,000.

Recommendation was made by the Port of New York Authority in a hearing in New York on Nov. 10 before a board of army engineers appointed by the Chief of Engineers to study the problem of bridge clearances on the Hudson River that the war department establish a minimum clearance of 185 ft. for bridges to be built in the future in the port district as far north as Hastings, and 150 ft. for bridges within the port district north of Hastings.

Stream Pollution, with particular reference to wastes from canning factories and creameries, will be studied by a committee appointed jointly by the New York state department of health and the state conservation department. The former is represented by M. K. Bracket, chief inspector, Emmeline Moore, biologist, and Russell Suter, executive engineer, state water power and control commission; the latter by C. A. Holmquist, director, and A. F. Dappert, assistant sanitarian, of the division of sanitation.

Brick Distribution direct from kiln to bricklayer by means of containers of 1½ tons capacity has been employed in the construction of a large building in London. To meet motor-truck competition, the London, Midland & Scottish Ry. developed these containers, which are loaded at the kilns, hauled to London by rail and then delivered to the job, where they are hoisted to the floor on which bricklaying is in progress. The service is said to be quicker than by truck, while the container service avoids much rehandling on the job.

Negotiations have been entered into by the Metropolitan Water District of Southern California with the Los Angeles Clearing House Association to determine if the district can borrow $260,000 with which to increase its program of preliminary work on the proposed Colorado River aqueduct. Until bonds from the $220,000,000 issue voted in September can be validated, the district has only the proceeds from a 3c. tax levy to finance its activity.

SOCIETY CALENDAR

AMERICAN ROAD BUILDERS' ASSOCIATION, Washington, D. C.; annual convention and road show, Detroit, Mich., Jan. 9-15.

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York City; annual meeting Jan. 19-22, New York City.

AMERICAN WOOD PRESERVERS' ASSOCIATION, Chicago; annual meeting, St. Louis, Jan. 26-29.

NATIONAL PAVING BRICK ASSOCIATION, Washington; annual meeting, Chicago, Feb. 10-12.

NATIONAL SAND AND GRAVEL ASSOCIATION, Washington; annual meeting, Pittsburgh, Jan. 27-29.

AMERICAN RAILWAY ENGINEERING ASSOCIATION has nominated officers as follows: president, J. V. Neubert, chief engineer of maintenance-of-way, New York Central R.R.; vice-president, J. E. Armstrong, assistant chief engineer, Canadian Pacific Ry.

ENGINEERS SOCIETY OF MILWAUKEE has elected as president Harry Sloan, advisory engineer of the Vilter Manufacturing Co.; vice-president, Fraser Jeffrey; secretary, H. W. Rohde.

METROPOLITAN SECTION, American Society of Civil Engineers, took improvements in rapid-transit subway design as the subject of its meeting on Nov. 18, 1931. A. I. Raisman, designing engineer of the New York City board of transportation, described the new features of the new Eighth Ave. system which have been developed as the result of experience with the structures and equipment of the older subways. Charles H. Stevens, chief engineer, Philadelphia department of city transit, described developments in subway design in that city, some of which are quite different from those in New York. Robert Ridgway and John R. Slattery, chief engineer and deputy chief engineer, board of transportation, took part in the discussion. Consideration of the subject of the meeting was interrupted following the presentation of the papers in order to call upon Dr. Karl E. Hilgard, of Zurich, Switzerland, one of the oldest members of the society, who is now in this country on a visit.

MINNESOTA SECTION, American Water Works Association, held its 21st annual meeting at St. Paul, Oct. 30-31. Ole Forsberg was elected chairman for the ensuing year, and John Druar was elected vice-chairman.

Personal Notes

Arthur P. Davis, former director the U. S. Bureau of Reclamation, h been selected to succeed the late A. Wiley as a member of the engineerin board of review of the Metropolita Water District of Southern Californi

Albert W. King has resigned a service manager for the Cowha Engineering Co., of Chicago, as a resul of receivership action affecting th Consolidated Cement Corp., the larges of the cement companies operated under the Cowham system.

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Obituary

James H. Caldwell, chairman of the board of the Ludlow Valve Mfg. Co., of Troy, N. Y., died on Nov. 18. Mr. Caldwell, who was born in Mobile, Ala., 66 years ago, was graduated from the Rensselaer Polytechnic Institute with the class of 1886. Before going to Troy, he had engaged in engineering enterprises in various parts of the country, including the installation of the electric lighting system for the city of New Orleans.

John C. Hume, assistant engineer in charge of the topographical division of the engineering bureau of the Borough of the Bronx, New York City, died suddenly on Nov. 19 of a heart attack. Mr. Hume, who was 73 years old, was graduated from the College of the City of New York in 1881 and had been assistant engineer in charge of the topographical division since 1912.

Anthony De Franceschi, pioneer in reinforced-concrete construction in Memphis, Tenn., died suddenly from a stroke of paralysis at his birthplace, Udine, Italy. Mr. De Franceschi, who was 58 years old, came to America as a young man. He was an expert in reinforced-concrete construction and built several buildings in Atlanta, Ga., and Memphis. He retired six years ago.

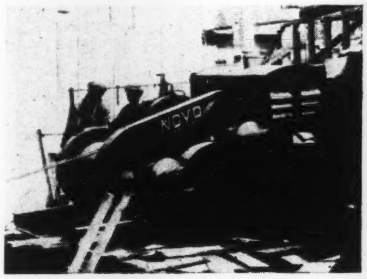
Samuel P. Baird, of Columbus, Ohio, deputy county surveyor until Aug. 1 last, died on Nov. 6, aged 66 years. For many years he was superintendent of the Portsmouth Street Railroad & Light Co., of Portsmouth, Ohio, and as a civil engineer he had built many electric light plants in Ohio, Missouri and Illinois.

Newton Davis Benson, of Providence, R. I., died on Nov. 18. Mr. Benson was born 55 years ago and was graduated from Massachusetts Institute of Technology in 1899. Since 1906 he had been in private practice in Providence and with the Stone & Webster Engineering Corp., of Boston. He had charge of design and structural work on power stations in Seattle, Wash., and Columbus, Ga., and additions to stations at Terre Haute, Ind.; Tampa, Fla.; Lowell, Mass.; El Paso and Dallas, Tex.

Construction Equipment and Materials

Heavy-Duty Construction Hoists

To meet hoisting requirements on construction jobs, such as handling and setting steel, operating a concrete bucket, handling a high-speed material elevator or for clamshell bucket work, the Novo Engine Co., Lansing, Mich., has added to its line the model RH hoist, built in single-, double- and triple-drum types, powered with an electric motor or gasoline engine. Anti-friction bearings are used throughout, the drum idler and intermediate shaft being equipped with self-aligning roller bearings capable of carrying radial and thrust loads. Side frames are of structural steel electrically welded to the base, which is formed by two steel I-beams turned up and welded on each end to form skids. Power is transmitted from the 75-100-hp. motor through a quadruple roller chain in a case located on the opposite side from the operator. Capacity is 6 to 8 tons on a single line.



Double-drum hoist erecting steel

◆

Small Self-Propelled Ditcher

To meet the needs of contractors and public utilities interested in laying small pipe lines and conduits the National Equipment Corp., Milwaukee, Wis., has developed the Parsons Model 14 ditcher, mounted on pneumatic tires, which can propel itself from job to job while observing only the regulations applying to motor trucks on streets and highways. No auxiliary equipment is necessary, and the ditcher is ready for use as soon as it reaches the job. The machine is 7 ft. 3 in. high and 6 ft. 9 in. wide; including conveyor. It will cut a trench 6, 9 or 12 in. wide to a maximum depth of 4 ft. 6 in. There are twenty digging speeds, forward and reverse, the highest being 16 ft. per minute. Road traction is obtained through four transmission gears with a maximum speed of 6.4 m.p.h. The self-cleaning buckets are cast integral with the driving chain. Power is provided by a McCormick-Deering industrial tractor unit. Construction features include ball and roller bearings and inclosed gears.

Light ditcher mounted on pneumatic tires

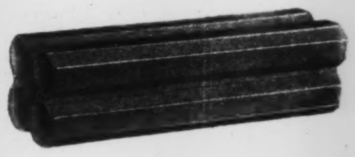
◆

Water Spray Cleans Strainer

Particularly adapted to the removal of sludge or sewage from waste water, an automatic motor-driven strainer marketed by H. A. Brassert & Co., 310 South Michigan Ave., Chicago, Ill., eliminates a considerable labor item because no attendants are required for periodical cleaning. The strainer consists essentially of a vertical screen cylinder revolving in a cast-iron housing. Water enters the housing, passes through the revolving screen to the interior of the cylinder, and is discharged at the bottom. About 1½ per cent of the main flow, already screened, is continuously jetted from within the screen cylinder through a narrow floating orifice, or slot, into a waste compartment which drains separately from the main discharge. Thus, as the screen revolves, the spray acts continuously to remove and carry away deposited solids. As the active screening area of the revolving cylinder is greater than the total area of the main inlet, and as the screen is continuously cleaned, the straining unit causes a very slight pressure drop and is not subject to sudden stoppages. The motor drive consists of a wholly inclosed motor arranged for vertical mounting on a heliocentric speed-reducing unit. Strainers are available for any size pipe line from 4 in. up and for any water pressures up to 125 lb. per sq.in. Aside from their application in sewage disposal, they can be used in many industrial installations for the protection of pipe lines, valves, spray nozzle, pumps and similar apparatus.

Multiple-Duct Clay Conduit

Laying underground cables for the distribution of electricity is facilitated by a new product of the National Fireproofing Corp., Fulton Building, Pittsburgh, Pa., consisting of two-way and four-way multiple-duct vitrified clay conduit with a taper joint which may readily be sealed or cemented when additional tightness is desired. In each unit the individual ducts are held permanently together by links of vitrified clay, offering much greater and more positive separation, insulation and arc resistance with a decided saving in spacers, concrete or mortar separation and no danger of hidden voids. In the four-way conduit an extra duct, centrally located, is available for small wires or cables or for heat dissipation. Duct lines built of the new conduit are said to occupy no more space and to be much lighter in weight than other comparable types. Units are available for 3½- and 4½-in. cables with standard lengths of 24 in. for two-way units and 36 in. for four-way. Short lengths and mitered shapes for curve construction can also be supplied.

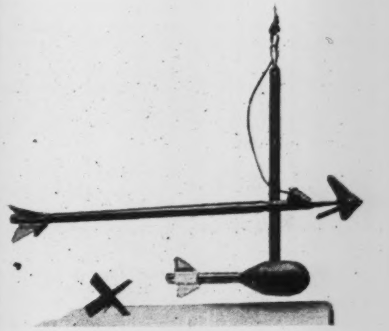


Four-way multiple-duct conduit

◆

Current Meter Designed for Minimum Flow Interference

Through a unique design eliminating bearing friction and general refinements in shape for reducing flow interference the Scientific Instrument Co., 1441 Walnut St., Berkeley, Calif., has produced a compact, lightweight, propeller-type current meter designed to perform with equal efficiency in all recognized methods of flow measurements, including vertical integration. Having sym-



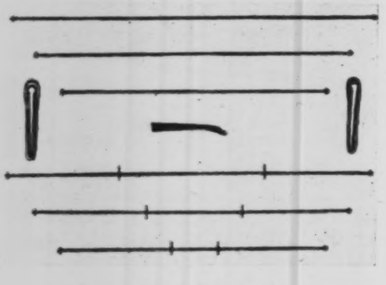
Propeller-type current meter

metrical lines, the instrument measures velocities with a minimum of flow disturbance. To accommodate a wide range of velocities the meter is provided with a shifting contact by which the relation of the number of revolutions per contact may be set at 1:2, 1:5 or 1:10.

◆

Form Tie Removed by Hand

Form ties for concrete foundation walls which can be snapped off by hand, without the use of tools, at the wall surface after the forms are stripped are being marketed by the Richmond Screw Anchor Co., Inc., 243 Bush St., Brooklyn, N. Y. The ties are designed for use with 1-in. sheathing and 2x4-in. studs in walls with thicknesses varying from 4 to 24 in., with or without spreaders. Although each tie has a working load value of 3,000 lb., with an ultimate strength of more than 4,000 lb., it is so designed that a pull in the proper direction will snap it off at the proper point. The holder used at each end is of the gravity type and is easily slipped into place or removed. No washers are used.



Form ties and fasteners

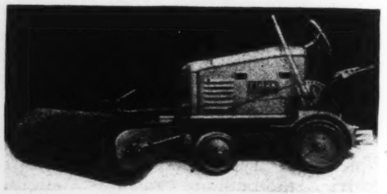
◆

Large Electric Plants

Two motor-driven electric plants capable of producing 20 kw. direct current and 25 kva. alternating current, respectively, have been announced by the Kohler Co., Kohler, Wis. These are particularly adapted to use at construction camps and oilfields, on large country estates and for stand-by service on large ships and barges and in small communities. In construction and operation the new units resemble smaller plants produced by this company. They are powered by six-cylinder, heavy-duty industrial engines of the L-head type with full pressure lubrication, radiator and pump cooling systems and 12-volt starting systems with separate batteries.

Power Sweeper on Light Tractor

By mounting a 60-in. broom on a gasoline-powered tractor, a unit capable of cleaning 42,000 sq.ft. per hour on piers, warehouses and other large areas, has been produced by the Clark Tructractor Co., Battle Creek, Mich. The broom clears a path 52 in. wide, sweeps right or left, and the angle of sweep can be changed in less than 1 min. The height of the broom can be changed by the driver at will, and a special clutch lever will stop rotation instantly. When not sweeping, the unit has a maximum speed of 7½ m.p.h., carrying the broom 6 in. above the floor or pavement. In operation, best results are obtained at a speed of 2 m.p.h. The outfit can be equipped with electric lights and a sprinkler system, if desired.

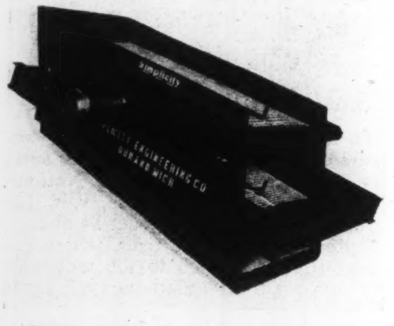


Light power sweeper

◆

Direct Motor Drive for Screen

Five unusual features distinguish the model B 4x8-ft. gyrating screen produced by the Simplicity Engineering Co., Durand, Mich., in single,- double- and triple-deck types. These comprise direct mounting of the motor on the gyrating shaft, interchangeability of shaft assemblies in a short time, the use of rubber mountings in place of springs, field adjustment of screen angles for maximum efficiency, and field adjustment of balance compensator for smooth operation. Direct mounting of the motor on the shaft is of unusual importance, as it eliminates the gears, pulleys, belts, flywheels and other devices usually found on screening equipment. Elimination of gear hum permits the screen to operate very quietly. Other types of drive, however are also available if desired.



Triple-deck vibrating screen with direct motor mounting

New Publications

Road-Mix Pavements — THE ASPHALT INSTITUTE, 801 Second Ave., New York City, in cooperation with the U. S. Bureau of Public Roads and a number of state highway departments, has prepared a 59-p. illustrated booklet describing in detail methods of constructing road-mix or mixed in place pavements for secondary roads. Two general types are considered, the first using continuously graded gravel or crusher rock stone, the second a uniform crushed stone product, such as slag or washed gravel.

Models—A number of small-scale structural models built by the H. E. BOUCHER MFG. CO., 150 Lafayette St., New York City, are illustrated in a 24-p. booklet, "The Third Dimension," now being distributed. Structures of engineering interest included comprise bridges, a railroad terminal, buildings, a steamship terminal, a dredge, a floating crane and a model illustrating the method used in constructing a subway.

Floating Cranes—WELLMAN ENGINEERING CO., Cleveland, Ohio, has prepared a 4-p. folder describing one of the largest seagoing cranes ever built. This unit, mounted on the old battleship "Kearsarge," of the U. S. navy, has two main hoists of 125 gross ton capacity at 101 ft. radius and an auxiliary hoist of 40 gross tons capacity with a reach of 173 ft. from the center of rotation.

Concrete Blocks—Curb-gutter blocks of precast concrete made by a special patented machine are described in a folder published by the AMERICAN CURB-GUTTER BLOCK CO., INC., 499 Seventh Ave., New York City.

Reinforced-Concrete Buildings—Examples of savings in a number of large buildings utilizing reinforced concrete and concrete joist construction are given in a 4-p. folder prepared by the forms department of the CONCRETE REINFORCING STEEL INSTITUTE, Tribune Tower, Chicago, Ill.

Sidewalk Elevators—"Architects' Specifications for Warner's All-Steel Sidewalk Elevators" is the title of a 4-p. folder prepared by the WARNER ELEVATOR MFG. CO., Cincinnati, Ohio.

House Insulation—NATIONAL COMMITTEE ON WOOD UTILIZATION of the U. S. Department of Commerce, through the cooperation of a group of authorities on building and housing, has prepared a 52-p. booklet "House Insulation: Its Econcmies and Application," which outlines the history and uses of insulating materials. Approximate cost tables for various types of houses are a feature. This may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 10c. per copy.

Glazed Terra Cotta—Terra cotta wall ashlar glazed on both sides or scored on the back to receive plaster or for the usual bonding with brick or hollow tile is described in a 24-p. illustrated bulletin of the FEDERAL SEABOARD TERRA COTTA CORP., 10 East 40th St., New York City.

Welding Rod—A data sheet giving characteristics, uses and directions for applying Amsco nickel manganese steel welding rods, hard surfacing welding rods and Fahralloy welding rods has been issued by the AMERICAN MANGANESE STEEL CO., 389 East Fourteenth St., Chicago Heights, Ill.

Double Diaphragm Pump—A 6-p. folder describing the many improvements made in the Parker Adnun pump, a 3-in. double diaphragm unit with a maximum displacement of 8,000 g.p.m., has been prepared by the ADNUN ENGINEERING & MFG. CO., Nunda, N. Y. Sales for this unit are handled by the Foote Co., also of Nunda.

Tubular Towers—SAWHILL MFG. CO., Pittsburgh, Pa., has prepared a 4-p. folder illustrating details of construction used in Monarch tubular towers for building construction.

Drainage—A complete line of drainage products to meet modern municipal needs is described in a 24-p. illustrated catalog 9 published by the ARMCO CULVERT MFRS. ASSN., Middletown, Ohio.

Valves—A new and complete reference book on valves has been issued by the HOMESTEAD VALVE MFG. CO., Coraopolis, Pa. It contains 48 pp.

Ready-Mixed Concrete—Tabulated records of costs and prices of ready-mixed concrete, as produced at twenty different plants, together with details of the figures upon which these records are based, are given in a 16-p. pamphlet prepared by the CHAIN BELT CO., Milwaukee, Wis. The plants include both those in which wet concrete is hauled in agitator trucks or machines, and those in which dry batches are delivered to truck-mixers for mixing the concrete during transit or at the job.

CONSTRUCTION NEWS

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Some of the Week's Large Projects

For further details turn to appropriate sections in this issue

Location	*Project*	*Cost*	*Status*
Bridges			
Albany	Bridge	$2,490,023	Contract
Streets and Roads			
Missouri	Roads and bridges	3,000,000	Bids asked
Railways			
Texas	Railway	3,000,000	Proposed
Subways and Tunnels			
Brooklyn	Subway	17,300,000	Proposed
Whitestone and College Pt.	Subway	16,000,000	Proposed
Power Plants			
Augusta (Ga.)	Electric light and power plant	2,500,000	Proposed
Elmira (N. Y.)	Power plant	1,000,000	Separate contracts
Regina (Sask.)	Power development	12,207,135	Proposed
Buildings			
New Orleans	University	2,000,000	Proposed
New York	Art museum	3,350,000	Proposed
New York	Trades school	1,000,000	Proposed
Otisville (N. Y.)	Sanitarium	2,000,000	Proposed

WATERWORKS

PROPOSED WORK

Ill., Colchester—City Council waterworks, incl. 72,000 gal. storage tank, concrete, brick pump house, 50,000 gal. well, 2 centrifugal pumps, 43,046 lin.ft. 4- to 8-in. c.i. pipe. $70,000. W. A. Fuller Eng. Co., 2916 Shenandoah Ave., St. Louis, Mo., engrs. Noted Sept. 3.

Ill., Moline—City Council, H. Huey, mayor, waterworks, new reservoir, filtration plant, new mains. $350,000. Pearse, Greeley & Hanson, 6 North Michigan Ave., Chicago, engrs. R. M. Renell, city engr. Noted Feb. 6.

Mass., Worcester—City, L. A. Goodale, water comr., City Hall, rein.-con. dam at Holden. $15,000 or more. Engineer not appointed.

Mich., Negaunee—Extending waterworks, incl. filter plant, extending intake 1,000 ft. further into Teal Lake. $89,800. Pearse, Greeley & Hansen, 6 North Michigan Ave., Chicago, Ill., engrs.

Mont., Kalispell—City, W. Buckingham, water deputy, improving waterworks, incl. 18 in. c.i. pipe line, 20 in. c.i. pipe from reservoir to Oregon St. $50,000.

Tex., Houston—City, c/o W. E. Monteith, mayor, soon takes bids c.i. mains in Green Biar St. from University to South Blvd.; South Blvd. to Shepard to Kilham and in Richmond St., from Shepard to McDuffie Sts. $36,000. J. M. Nagle, city engr.

Tex., Muenster — Waterworks. $40,000. **Maturity 1932.**

Ont., Almonte—Federal Govt. approved construction waterworks extension. $40,000.

Ont., Belleville—For 6,000 ft. 18 in. c.i. auxiliary pipe line from filtration plant to city, incl. valves, hydrants. $65,000. C. A. Mott, City Hall, engr.

Ont., Sombra—Village soon takes bids waterworks, incl. wells, c.i. mains, electrical pumps, valves, hydrants, etc. $15,000. L. G. McNeice, Orillia, engr.

BIDS ASKED

Conn., Hartford—Dec. 7, by Bd. Contr. & Supply, Metropolitan Dist., Hartford Co., Municipal Bldg., 550 Main St., 1,700 ft. borings at Bills Brook Dam Site, and clearning south end reservoir site, Barkhamsted; furnishing, delivering, assembling one sand washing machine at Water Bureau Filter Plant, West Hartford; furnishing and delivering 1 portable air compressor, to Water Bureau, Union St. Yard, Hartford. R. Dillon, clk.; adv. E.N.-R. Nov. 26.

Conn., Meriden—See "Contracts Awarded."

N. Y., Long Island City—Dec. 1, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, pressure filters, lime feeding apparatus, pipe lines, appurtenances for Flushing Iron Removal Plant, at Fresh Meadow Lane and Underhill Ave. Noted Mar. 19.

N. Y., New York—Dec. 1, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., mains in Eden Terrace, Boscobel, Jesup, Lakewood and Wiegand Pls., St. Ouen, East 165th, East 183rd, East 223rd, and West 169th Sts., Astor, Barker, Bruner, Croes, DeReimer, Ely, Jerome, Jesup, Laconia, Leland, Netherland, Ogden, Seward, Tiemann, Van Nest, and Wilson Aves., Bronx Boro.

N. Y., Poughkeepsie—Dec. 8, by Bd. Water Comrs., at office C. W. Garrison, 50 Market St., 17,500 lin.ft. c.i. mains, 2 master meters, gates valves, hydrants for waterworks of Arlington Water Dist.; adv. E.N.-R. Nov. 26.

CONTRACTS AWARDED

Conn., Meriden—Watermain extension program, unemployment labor under supervision Town's Engineering Dpt. $100,000 bond issue for same.

Ill., Chicago—See "Unclassified."

Ind., Knightstown—Bd. Comrs. Indiana Soldiers and Sailors Childrens' Home, watermains, to R. M. Cotton Co., 1720 East 10th St., Indianapolis; deep well pump, to H. D. Cook Co., Lawrenceburg; tank and tower, to Pittsburgh-Des Moines Steel Co., Neville Island, Pittsburgh, Pa. Est. $40,000. Noted Oct. 29.

Mich., Detroit—D. C. Grobbell, acting secy. Dpt. Water Supply, 735 Randolph St., wall facings and miscellaneous structures at new Springwells Filtration Plant, to Misch Bros., 3005 Gratiot Ave., $63,100; furnishing 12 sets each of 24, 30, 36, 42 and 48 in. gate valve parts, f.o.b. Detroit, to Johnson City Fdry. & Machine Co., Johnson City, Tenn., $6,937.

Mo., Maryville—City, waterworks improvements, general contract and dam, to Carrothers & Crouch, 2710 McGee St., Kansas City, $26,700; pumps, to Forslund Pump & Mchy. Co., 3033 Main St., Kansas City, $1,650; mechanical filter equipment, to E. W. Bacharach & Co., Rialto Bldg., Kansas City, $4,750. Grand total $33,100. Noted Oct. 15.

N. Y., Brooklyn—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Avenues K, N, and W, to Empire Contg. Co., 13 Park Row, New York, $3,480. Noted Oct. 22.

N. Y., New York—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., mains in South and Marginal Sts., to Bronx Water Works Co., 1 Riverdale Ave., $118,615.

N. Y., New York—Dpt. Water Supply Gas & Electricity, Municipal Bldg., New York, mains in Madison Ave., to Beaver Eng. & Contg. Co., 51 Chambers St., $33,994. Noted Oct. 29.

N. Y., St. George—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Auburn, Mallory Sts., to G. V. Cornell Constr. Co., 30 Egbert Pl., New York, $11,640. Noted Oct. 29.

Ont., Oshawa—Public Utilities Comn., Contr. A, filtration plant building and piping under same, to W. J. Trick Co., 25 Albert St., $67,735; Contr. B, supplying, installing filtration plant equipment, to W. J. Westaway Co., Ltd., 38 Main St., West Hamilton, $50,885. Noted Nov. 12.

SEWERS

PROPOSED WORK

Conn., Farmington—Town small pumping station, 400 g.p.m., 50 ft. lift, 5,500 ft. 12 in. tile sewers, 2,500 ft. 8 in. c.i. force mains, small Imhoff tanks. Noted Apr. 2.

Ill., Chicago—Dec. 17, by J. J. Sullivan, clk., Sanitary Dist. of Chicago, 910 South Michigan Ave., West Side Intercepting Sewer, Contr. 5; adv. E. N.-R. Nov. 26.

Ill., Harrisburg—City Council sanitary sewerage system, $353,000; storm sewerage system, $170,700; sewage disposal plant $87,500. Russell & Axton, 6200 Easton Ave., St. Louis, Mo., engrs.

Ill., Rockford—Sanitary Dist. of Rockford sanitary sewers, appurtenances, incl. 450 cu.yd. shale rock, 900 cu.yd. solid rock excav. 6, 8 and 10 in. pipe in Orchard Heights, Hutchins, Kellogg and Sheldons, O. W. Haeggs, Day, King, and Coltons Subdivisions. $70,000. B. C. Harvey, 1705 Guilford Rd., engr.

Mich., Lansing—Pumping station, 12,000 ft., 36 in., c.i. pressure main, relief sewer for Lansing Ave. and northeastern section. $500,000 bonds voted. S. C. Jacka, City Hall, engr.

N. J., South River—Boro Council sewage disposal plant. Engineer not appointed.

Pennsylvania—Allegheny Co. (Pittsburgh) sewage treatment plants, in towns along Allegheny River, from Ford City to New York State line. J. N. Chester Engineers, Clark Bldg., Pittsburgh, engrs., for several towns.

Ont., Brantford—City Council soon takes bids storm sewers. $200,000. A. Fairchild, city engr. Noted Sept. 17.

Ont., Mimico—Soon takes bids sewage disposal plant. $40,000.

Ont., Timmins—Town Council, sewers $40,000.

Ont., Peterboro—See "Sports and Parks."

BIDS ASKED

Conn., Meriden—See "Contracts Awarded.'

N. Y., Long Island City—Nov. 30, by G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., sewers in Northern Blvd., 59th Rd., 40th, 59th, 61st Drs., Fuller Arrandale and 164th Pls., 23rd, 61st, Forest, Juniper, Sanford, Maple, 107th, Hollis Aves., 63rd, Harrow, Penelope, Mazeau, Hollywood, 168th, 210th, 164th, 189th, 193rd, 214th, Inwood and Brinkerhoff Sts.

N. Y., Newburg—Dec. 10, at office F. W. Ward, adj. gen., Capitol, Albany, sewers, waterlines at State Armory; adv. E.N.-R. Nov. 26.

N. Y., Oneonta—Dec. 15, at office Bd. Educ. Dpt., Education Bldg., Albany, sewers, water lines at Oneonta State Normal School. F. P. Graves, comr.; adv. E.N.-R. Nov. 26.

Alta., Lethbridge—See "Contracts Awarded."

CONTRACTS AWARDED

Calif., Los Angeles—Sanitary sewers in Loring Ave., between Bainbridge and Warnes Aves., incl. 132 lin.ft. 8 in. c.i. pipe, 22,988 lin.ft. 8 in. concrete pipe, 65 "B", 1 drop "S" and 14 flushing "E" manholes, 14 "F", 1 "G" and 4 "H" junction chambers, 12 "X" lampholes, 101 manhole frame and cover sets, 10,461 lin.ft. 6 in. house sewers, 61,268 sq.ft. Class A and 300 sq.ft. Class D resurfacing, to Mlagenovich & Gillespie, 1032 West 73rd St., $35,198.

Conn., Meriden—Sewer main extension program, unemployment labor, under supervision Town's Engineering Dpt. $150,000 bond issue for same.

See proposal advertising on page 50

LEADITE

Trade Mark Registered U.S. Pat. Office

LEADITE *Saves* at least 75% over the "Caulking Method" of Jointing bell and spigot pipe

Of course, the big saving offered by the use of LEADITE is in the COST OF MATERIAL,—but it is significant that LEADITE affords many other savings,—for instance: LEADITE requires no caulking; and, because it is light in weight, LEADITE is easier and less expensive to handle on the job,—and saves in Freight Charges as well. Then again, because it melts at a much lower temperature, LEADITE reduces fuel costs. Still further, LEADITE offers the following additional savings: Cost in Digging bell holes,—Cost in Pumping Wet Trenches,—Reduced leakage costs, which saves in interest charges (by getting the water in the line quickly).

The savings which LEADITE effects might be used for additional extensions, or other improvements.

The pioneer self-caulking material for c. i. pipe
Tested and used for over 30 years.
Saves at least 75%.

THE LEADITE COMPANY
Land Title Building - Philadelphia, Pa.

No Caulking

Sewers—(Continued)

Ill., Chicago—See "Unclassified."

Neb., Grand Island—City Council, 1,700 ft. storm water sewer in various streets, to Chambers Constr. Co., 701 1st Natl. Bank Bldg., Lincoln, $46,200; replacing concrete sewer in Eddy St. and vitr. clay sewer in Sycamore and Oak Sts., to above contractor and O. F. Bleisberg Co. 408 North Wheeler St., Grand Island. Est. $5,000.

Neb., Omaha—City Council, Main Sewer 1100 in 72nd and Bedford Sts., to 78th St. and Blondo Sts., using **(a)** vitr. clay pipe or **(b)** concrete pipe to Busche & Gavenman Constr. Co., Omaha, **(a)** $14,793 or **(b)** $14,682; Storm Sewer 1107, Spring Lake Park, between C and F Sts., to Beltz Constr. Co., Omaha, **(a)** $5,980 or **(b)** $6,434.

N. Y., Long Island City—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., to Pan Constr. Co., 244 Jackson Ave., sewers in 54th Ave., $2,885, 72nd St. $1,447, 93rd St. $3,192, 116th Dr. $8,721; to Catam Co., Inc., 8211 Bay Parkway, Brooklyn, 54th St. $3,837, 54th St. $6,854; to J. H. Johnson, 37 Britton Ave., Elmhurst, 33rd Ave. $4,153; to J. Pescia, in 96th St. $612; to V. Clemente, 1135 Spofford St., New York, in 104th Ave. $2,010; to DiSalvo Contg. Co., 2441 Butler St. E, Elmhurst, 104th Ave. $5,171; to L. DiNapoli, in 115th Rd. $1,901, 115th Ave. $5,777, 153rd St. $5,871; to P. Ambrosio, 674 Glenmore Ave., Brooklyn, 134th St. $3,426; to A. Clement, 6854 Orravalle St., Forest Hills, 164th Pl. $3,158; to Gifford Constr. Co., 161-10 Jamaica Ave., Jamaica, Austin St. $5,717; to H. R. Ponepuks, Carpenter Ave., $836—to A. Ioffredain, Ferndale Ave., $1,208; to J. Clemente, in Inwood St. $1,261; to A. Maio, 123-07 116th Ave. $3,040; to C. Soverio, 157 Ashford Pl., Brooklyn, Newburg St. $2,513. Grand total $73,590.

Pa., Pittsburgh—E. G. Lang, dir. Dpt. P. Wks., City-County Bldg., sewers in 5th Ave. and Hawthorne St., to F. Manella, 1507 North Lang St., $890 and $10,680 respectively; McFarren Ave., to J. and R. Very, 701 Hays St., $1,846; Summerdale St. and catch basins in Superior Ave., to Bloomfield Constr. Co., 4925 New St., $2,993 and $1,860 respectively; retaining wall in McCord St., to R. Dinardo, 448 Norton St., $1,694; new asphalt roof for Aspinwall Pumping Station, to M. G. Moshites, 1010 Beech Ave., $893; street intersections, to Parkview Constr. Co., 373 Boquet St., $8,328; repairs to trusses and fence on Bloomfield Bridge, to Standard Eng. & Constr. Co., Grant Bldg., $2,360; scruppers and cleaning drains to South 22nd St. Bridge, to A. R. Van Horn, 402 West North Ave., $497. Grand total $32,041.

Tex., Houston—City Secretary, storm and sanitary sewers, in Missouri Ave., from Woodhead to Morse Sts. and in East and West 20th St., from North Main to Yale Sts., to Elder Constr. Co., 4714 Jack St., $5,158 and $27,024 respectively.

Alta, Lethbridge—Storm sewer, day labor under supervision J. Haines, city engr. $100,000 bond election, Nov. 20, for same. Provincial and Federal Governments paying most of cost.

WASTE DISPOSAL

PROPOSED WORK

N. J., Linden—Bd. City Council, City Hall, municipal incinerator. $25,000 or more. Engineer not appointed. **Maturity probably soon.**

BIDS ASKED

Ind., Indianapolis—Dec. 1, by Bd. Sanitary Comrs., B. J. T. Jeup, pres., fabricating, furnishing, installing 32 or less digesters, incl. removing old digesters in garbage reduction plant.

BRIDGES

PROPOSED WORK

Kan., Belle Plaine—State Hy. Dpt., Topeka, and Summer Co., Wellington, soon take bids bridge over Arkansas River, State Hy. 55, 4.5 mi. east of here. $80,000.

Kan., Kansas City—City Council preliminary plans three 40 ft. spans steel bridge, concrete flooring, piers over Jersey Creek at 8th St. $25,000. C. E. Peterson, City Hall, engr.

Pa., Homestead—Allegheny Co., Pittsburgh, preliminary surveys, sketches replacing bridge over Monongahela River. $3,000,000 bonds voted. V. R. Covell, 519 Smithfield St., Pittsburgh, engr. Noted Apr. 9.

Texas—State Hy. Comn., W. R. Ely, chn., Austin, soon takes bids 2 rein.-con. bridges, 1 over Brushy Creek and other over Brushy Creek Relief, 22 ft. roadway, Hy. 72, Federal Aid Project 542-C, De Witt Co., $25,000. J. S. Fenner, Box 11, Cuero, resident engr.

New Jersey—State Hy. Comn., Trenton, bridge on Route 37, Lakeside Park, Mercer Co.; bridge over Pennsylvania R.R., Old Bridge, Middlesex Co. $100,000 each. Railroad to share cost on latter bridge.

BIDS ASKED

Florida—Dec. 7, by State Road Dpt., Tallahassee, B. M. Duncan, state hy. engr., 4 bridges over Nassau River, incl. one main structure 600 ft. long of continuous I-beam spans, concrete decks on concrete piers, and 3 structures, totaling 418 ft., concrete desk girder spans on 18 in. precast concrete piling Project 57, Rd. 4, Nassau and Duval Counties.

Illinois—Nov. 30, by State Dpt. P. Wks and Buildings, Div. Hys., Springfield, 16 ft. rein.-con. substructure, 100 ft. steel superstructure, Route 47, Sects. 128 B and C, Ford Co.; one 24 ft., one 20 ft. rein.-con. slab bridges, three 45 ft. span rein.-con. girder bridge, Route 47, Sect. 129-B, Champaign Co. F. T. Sheets, hy. engr.

Maryland—Dec. 1, by State Roads Comn., Baltimore, G. C. Uhl, chn., substructure, superstructure (with exception structural steel span over railroad tracks), approaches, etc. Contr. CE-77-23—fabrication, erection structural steel girder span for proposed grade elimination over relocated tracks Pennsylvania R.R., Contr. Ce-123-23, both Cecil Co.—removing rein.-con. viaduct over Sligo Branch, Contr. M-197-37, Montgomery Co.—removing earth filled west causeway at site of removed hy. bridge, Contr. Q-74-28, Queene Anne's Co.; adv. E.N.-R. Nov. 26.

Michigan—Dec. 2, by H. W. Hagaman, div. engr., Saginaw, FBr. 1 of 25-4-11, Contrs. 2 and 3, one 40 ft. span, 2 rein.-con., abutments, semi-gravity type, steel deck girder, rein.-con. floor, concrete surface, two 2½ ft. sidewalks, 40 ft. roadway, Genesee and Shiawassee Counties, for State Hy. Comn., Lansing.

Michigan—Dec. 2, by J. T. Sharpensteen, div. engr., Escanaba, FBr. 1 of 27-6-8, Contrs. 2 and 3, one 40 ft. span, 2 rein.-con. abutments, steel deck girder, 30 ft. roadway, rein.-con. flooring, concrete surface, two 2½ ft. sidewalks, Gogebic Co., for State Hy. Comr., Lansing.

Okla., Choctaw—Dec. 7, by B. E. Carrigan, clk. Oklahoma Co., Court House, Oklahoma City, 2 span 220 ft. steel truss bridge on concrete piers. $25,000. J. F. Frazier, Court House, engr.

Pa., Allentown—Nov. 30, by Bd. Comrs., Allentown Co., repairing, reconstructing part 780 ft. bridge of 4 thru truss, 5 trestle and 1 thru girder spans, incl. new 64 ft. thru girder span, at Lehigh. J. Sieger, Allentown, engr.

Pa., Pittsburgh—Dec. 1, by R. G. Woodside, controller Allegheny Co., Court House, granite pylons, incl. cast aluminum doors for George Westinghouse Bridge over Turtle Creek, $170,000; hand railing and lampholes, malleable, $39,000. V. R. Covell, County Bldg., engr.

Texas—Nov. 30, by G. Gilchrist, state hy. engr., Austin, steel, concrete, rein.-con. bridges, in Woodville, Pecos, Concho, Guadalupe, Dallas and Brazoria Counties. Total est. $250,000.

Texas—Dec. 1, by G. Gilchrist, state hy. engr., Austin, steel, concrete, rein.-con. bridges, culverts on hys. in Menard, Bexar, Hopkins and Fayette Counties. Total est. $210,000.

Tex., Dallas—Dec. 3, by Dallas Co., c/o C. E. Gross, aud., one 50 ft. span, concrete, steel bridge, on Garland-Grapevine Rd.—one 60 ft. span bridge on Dallas Norwest Rd.—one 40 ft. span bridge, on Park Lane Rd., all to have 20 ft. roadway. R. H. Clinger, Records Bldg., engr.

Virginia—Dec. 8, by State Hy. Dpt., Richmond, five 30 ft. steel beam span bridge over Blackwater River, Route 12, Project F-160-Al-Bl, near Franklin in Isle of Wight and Southampton Counties; four 35 ft. span concrete bridge over Mulatto Creek, Route 16, Project F-206-B4, near Madison, Madison Co. H. G. Shirley, hy. engr.

CONTRACTS AWARDED

Del., Wilmington—New Castle Co., 1 span, 300 ft. bridge over Brandywine River, at 11th and Church Sts., to Seeds & Durham, 25 Maplewood Ave., Phila., Pa., $261,376. Noted Oct. 22.

Idaho—A. Harbour, comr. P. Wks., Boise, steel bridge, concrete approaches, Fremont Co., to J. J. Badraun, Portland, Ore., $24,500.

Michigan—A. L. Burridge, div. engr., Cadillac, MB 1 of 40-5-3C2 and 3, two 65 ft. spans, 2 rein.-con. abutments, steel deck girder, 30 ft. roadway, two 2½ ft. sidewalks, Kalkaska Co., for State Hy. Comn., Lansing, Contr. 2, to D. R. C. Foundry Co., Kalamazoo, $4,404; Contr. 3, to H. I. Davies, Escanaba, $17,639. Noted Oct. 15.

Michigan—H. L. Hagaman, div. engr., 504 Eddy Bldg., Saginaw, FB 1 of 18-6-1 Contrs. 1 and 2, one 45 ft. span, 2 rein.-con. abutments, steel deck girder, with rolled beams, concrete flooring, 40 ft. roadway, two 2½ ft. sidewalks, Clare Co., for State Hy Dpt., Lansing, Contr. 1, to McClintic-Marshall Corp., 1242 Book Bldg., Detroit, $1,257; Contr. 2, to M. J. Clearhout, Detroit, $12,645.

Michigan—H. W. Hagaman, div. engr., Saginaw, MBr. 2 of 76-15-14c-2 and 3, one 87½ ft. span, 2 rein.-con. abutments, steel deck girder, 40 ft. roadway, two 2½ ft. sidewalks, Shiawassee Co., Contr. 2, to Fort Pitt Bridge Wks., Massillon, O., $6,783; Contr. 3, to W. J. Anschutz, Carrollton, $15,861—MBr. 1 of 77-12-9C-1 and 2, three 55 ft. spans, 2 rein.-con. abutments, steel deck girder, 40 ft. roadway, two 6 ft. sidewalks, St. Clair Co., Contr. 1, to R. C. Mahon Co., Detroit, $6,502; Contr. 2, to Walter Toebe & Co., Shingleton, $25,177, for State Hy. Comn., Lansing. Grand total $54,323. Noted Oct. 22.

Michigan—H. W. Hagaman, div. engr., at office St. Clair Co. Road Comn., Port Huron, R BR 1 of 77-22-20, Contrs. 1 and 2, two 60 ft. spans, 2 rein.-con. abutments, steel deck girder, rein.-con. flooring, 30 ft. roadway, two 1½ ft. sidewalks, St. Clair Co., for State Hy. Comn., Lansing, Contr. 1, to Fort Pitt Bridge Wks., Massillon, O., $3,300; Contr. 2, to S. H. Brennaman, Detroit, $24,260 incl. cement.

Michigan—W. J. Kingscott, div. engr. at office Montcalm Co. Road Comn., Stanton, **(a)** R. Br. 1 of 59-14-20, Contrs. 2 and 3, one 60 ft. span, 2 rein.-con., abutments, steel deck girder with rein.-con. flooring, 22 ft. roadway, two 2½ ft. sidewalks, Montcalm Co. and **(b)** M. Br. 1 of 34-6-3, Contrs. 2 and 3, five 75 ft. spans, 2 rein.-con. abutments, steel deck girder rein.-con. flooring, one 2½ ft. and one 5 ft. sidewalks, 30 ft. roadway, Ionia Co., for State Hy. Comn., Lansing, to Fort Pitt Bridge Wks., Massillon, O., **(a)** Contr. 2 $1,463 **(b)** Contr. 2 $15,202; to Perkins Bridge & Supply Co., Flushing, **(a)** Contr. 3 $11,288 incl. cement; to Lovering & Longbotham, Ann Arbor **(b)** Contr. 3 $54,256 incl. cement.

Michigan—H. G. Oakes, div. engr., at office Washtenaw Co. Road Comn., Ann Arbor, R. Br. 1 of 81-14-25, Contrs. 1 and 2, two 50 ft. spans, 2 rein.-con abutments, steel deck girder, rein.-con. flooring, two 2½ ft. sidewalks, 30 ft roadway, Washtenaw Co., for State Hy. Dpt., Lansing, Contr. 1, to McClintic Marshall Corp., 1242 Book Bldg., Detroit, $2,294; Contr. 2, to Atlewed & Gager, Detroit, $15,153 incl. cement.

Michigan—A. L. Burridge, div. engr., Cadillac, FBr. 1 of 4-2-2, Contrs. 1 and 2, one 50 ft. span, 2 rein.-con. abutments, steel deck girder, rein.-con. flooring, two 2½ ft. sidewalks, 30 ft. roadway, Alpena Co., for State Hy. Comn., Lansing, Contr. 1, to Fort Pitt Bridge Wks., Massillon, O., $1,260; Contr. 2, to C. G. Bridges, Escanaba, $12,376.

N. J., Scotch Plains—Bd. Freeholders Union Co., Court House, Elizabeth, rein.-con., steel bridge over Elizabeth River, at South Ave., to D. Carro & Co., 816 South St., Elizabeth. Est. $25,000. Noted Oct. 15.

New York—A. W. Brandt, comr. **Hys., Albany**, bridge in Oneida Co., to Smith & Husted, Oriskany Falls, $28,163; est. **$41 430**—Mantle Grade Crossing Eliminating, Lewis Co., to Bert Shea, Inc., Hamilton, $32,043; est., $49,588.

N. Y., Albany—F. S. Greene, comr. Dpt. P. Wks., Albany, constructing Albany-Rensselaer Bridge and grade crossing elimination to Booth & Flynn, 1842 Forbes St., Pittsburgh, Pa. $2,490,023. Noted Oct. 15.

STREETS AND ROADS

BIDS ASKED

California—Dec. 2, by C. H. Purcell, engr., State Hy. Comn., Sacramento, grading, bituminous treated crushed gravel or stone (plant mix) on crusher run surfacing 9.2 mi. road between Willards and Susanville, Lassen Co.; grading, concrete surfacing 5.5 mi. road between Corona Del Mar and Laguna Beach, Orange Co.

Idaho—Dec. 1, at office A. Harbour, comr. P. Wks., Boise, grading, crushed graveling 8.92 mi. Meridian-Kuna Hy., S.A.P. 207-A, Ada Co.

Illinois—Nov. 30, by State Dpt. P. Wks. & Buildings, Div. Hys., Springfield, concrete, brick on concrete, or bituminous concrete on concrete surfacing 2.31 mi. Route 47, Sect. 127, Dist. 3, Ford Co.—6.13 mi. Route 47, Sect. 128, Dist. 3, Ford and Champaign Counties—5.06 mi. Route 47, Sect. 129, Dist. 3—6.88 mi. Route 47, Sect. 136, Dist. 5, both Champaign Co. F. T. Sheets, hy. engr.

Kansas—Dec. 1, by State Hy. Dpt., Topeka, light type surfacing 13.831 mi. Kansas Project 1277 Rd.K-45, Sumner Co. W. V. Buck, hy. engr.

Michigan—Dec. 1, by A. L. Burridge, div. engr., Cadillac, grading, drainage structures, 7.071 mi. MO10-16C-1, Benzie Co., for State Hy. Comn., Lansing.

Michigan—Dec. 1, by A. L. Burridge, div. engr., Cadillac, grading, shaping, drainage structures, one course gravel surfacing 0.568 mi. FO35-19C-1, 6 ft., Iosco Co., for State Hy. Comn., Lansing.

Michigan—Dec. 2, by W. J. Kingscott, div. engr., 213 Watson Bldg., Grand Rapids, widening grade, lengthening drainage structures 7.17 mi. MO41-55C-1, Kent Co., for State Hy. Comn., Lansing.

Michigan—Dec. 2, by W. J. Kingscott, div. engr. 213 Watson Bldg., Grand Rapids, grading, drainage structures, 2.613 mi. MO41-15C-3, Kent Co., for State Hy. Comn., Lansing.

Michigan—Dec. 2, by W. J. Kingscott, div. engr., 213 Watson Bldg., Grand Rapids, grading, drainafe structures 4.507 mi. MO62-9C-1, Newaygo Co., for State Hy. Comn., Lansing.

Michigan—Dec. 3, by W. J. Kingscott, div. engr., 309 McNair Bldg., Kalamazoo, grading, shaping, drainage, concrete paving 0.456 mi. MO39-22C-1, Kalamazoo Co., for State Hy. Comn., Lansing.

Missouri—Dec. 3, by State Hy. Comn., Jefferson City, improving 80 road and bridge projects. $3,000,000. T. H. Cutler, cr. engr.

Nevada—Dec. 2, by Director Dpt. Hys., Carson City, grading, drainage structures, preparing subgrade and shoulders, removing culverts

Streets and Roads (Continued)

and timber bridges, removing, reconstructing fences, crushed rock or gravel surfacing 22,700 cu.yd. road south of Fallon and Fallon Route 1-A, Churchill Co. S. C. Durkee, hy. engr.

Oklahoma—Dec. 1, by State Hy. Dpt., Oklahoma City, gravel top surfacing 20 mi. U. S. Hy. 64, east of Nash, 20 ft., Grant Co. $25,000; 21 mi. State Hy. 14, south of Snyder, 20 ft., Kiowa Co., $25,000. C. L. Wilson, hy. engr.

Okla., Oklahoma City—Dec. 7, by B. A. Carrigan, clk. Oklahoma Co., Court House, paving 5 mi. May Ave., 20 ft. $100,000. J. F. Frazier, Court House, engr.

Pa., Wilkes-Barre—Dec. 1, by City, widening, repaving Market St. from Welles St. to Hillside Ave. W. P. Johns, city engr.

Texas—Nov. 30, by G. Gilchrist, state hy. engr., Austin **(F.A.P. means Federal Aid Project and S.A.P. State Aid Project),** ½ in. limestone rock asphalt on gravel base surface treating 33.763 mi. Hy. 55, Job M-15-W-3, Uvalde Co., $100,000—traffic bound broken stone base surfacing 10.994 mi. Hy. 34, S.A.P. 859-H, Unit 2, Jack Co., $90,000—sheet surfacing 8.3 mi. Hy. 29, Job M-13-R-3, Calhoun Co., $25,000, all foregoing 18 ft. wide—concrete paving 82,960 sq.yd. Hy. 35, F.A.P. 125, Reopened, and 426-A, Reopened, Liberty Co., $140,000—91,236 sq.yd. Hy. 21, F.A.P. 499-A, Houston Co., $160,000—48,694 sq.yd. Hy. 14, S.A.P. 873-B and F.A.P. 569-B, Navarro Co., $76,000—triple bituminous on caliche base surface treating 17.189 mi. Hy. 7, F.A.P. 503-A, 18 ft., Lubbock and Hockley Counties, $126,000—grading, drainage structures 13.342 mi. Hy. 3-A, F.A.P. 633-B, Guadalupe Co., $76,000—9.903 mi. Hy. 123, S.A.P. 769-E, Wilson Co., $50,000—6.923 mi. Hy. 27, F.A.P. 619-A and B, Crockett and Pecos Counties, $40,000—9.597 mi. Hy. 155, S.A.P. 993-A, Harrison Co., $28,000, all foregoing 26 ft. wide.

Texas—Dec. 1, by G. Gilchrist, state hy. engr., Austin, **(F.A.P. means Federal Aid Project and S.A.P. State Aid Project),** triple bituminous on caliche and stone base surface treating 13.676 mi. Hy. 7, F.A.P. 583-A and B, Unit 2, Brown Co., $140,000—concrete paving 74,777 sq.yd. State Hy. 19, S.A.P. 631-B and F.A.P. 485-B, Houston Co., $120,000—45,203 sq.yd. Hy. 10, S.A.P. 977-B, Tarrant Co., $88,000—crushed conglomerate base surfacing 6.409 mi. Hy. 34, S.A.P. 859-G, Unit 2, Wise Co., $60,000, all foregoing 18 ft. wide—grading, drainage structures 14.26 mi. Hy. 154, S.A.P. 950-C, Hopkins Co., $56,000—6.259 mi. Hy. 44, S.A.P. 955-B, Fayette Co., $25,000—14.907 mi. Hy. 3-A, F.A.P. 633-A, Bexar Co., $64,000—16.674 mi. Hy. 43, F.A.P. 582-C, Robertson Co., $76,000, all foregoing 26 ft. wide.

Ont., Fort William—Soon takes bids bascule bridge approaches, road improvements. $312,500.

Ont., Smith Falls—Provincial and Dominion Govts. paving streets. $30,000. Work will probably be done by day labor.

Que., Quebec City—City Council bids in January paving in St. Jean Baptiste, Champlain, St. Roch, St. Sauveur, Limouilon and Belvedere Wards. $259,000.

CONTRACTS AWARDED

Georgia—State Hy. Bd., East Point, paving, widening bridge on 4.701 mi. Carroll Co., and 3.57 mi. Clarke and Oconee Counties, to Davis Constr. Co., Rhodes-Haverty Bldg., Atlanta, $72,509 and $84,732 respectively—paving 8.707 mi. Pike Co., to Carolina Contg. Co., Columbia, S. C., $140,398—grading 10.878 mi. Twiggs and Wilkinson Counties, to A. H. Singer, Lafayette, Ala., $42,849; bridge on same road, to Davis & Co., Moultrie, $7,964—bridge over Broad River, Washington-Elberton Hy., Wilkes and Elbert Counties, to F. A. Triplett, Cheraw, S. C., $38,606. Grand total $387,058. Noted Nov. 12.

Idaho—A. Harbour, comr. P. Wks., Boise, crushed rock surfacing 9.9 mi. North and South Hy., Adams Co., to Elmore Constr. Co., Mountain Home, $15,420; grading, crushed graveling 9.5 mi. Owyhee Hy., Canyon Co., to W. Hoops, Twin Falls, $46,405.

Ill., Bloomington—McLean Co. gravel surfacing 5 mi. Sect. M State Aid Route 1-A, to Ward & Prothero Co., Bloomington, $26,578—5 mi. Sect. L, State Aid Routes 2 and 1-A, to H. Berenz & Son, Bloomington, $32,713—3 mi. Sect. Q, State Aid Route 10, to Rowe & Gibson, Bloomington, $13,332. Grand total $72,623. Noted Oct. 1.

Ill., Cambridge—Henry Co., concrete paving 11,590 ft. Green River Section, to H. A. Reschke Co., Geneseo, $44,645.

Ill., Chicago—See "Unclassified."

Ill., Hillsboro—Montgomery Co., grading, traffic bound stone paving 4.7 mi. State Aid Road 11 from Walshville to Macoupin Co. line, to Edwardsville Constr. Co., Edwardsville, $36,147.

Kan., Kansas City—Brick paving State Avenue Trafficway from 25th St. to western city limits, to R. R. Schooley, 2503 North 12th St., $87,161—rock asphalt paving 14th St. from Washington Ave. to Washington Blvd., to G. C. Roudebush, 6th and Walker Sts., $6,035—grading 7th Street Trafficway from Metropolitan Ave. to B. L. Stein Rd., to Roberts Bros., 95 South 19th St., $73,570—East and West Alleys back of Wyandotte High School, to R. G. Aldridge Constr. Co., 1609 Nebraska St., $644—sidewalks on 10th Street Trafficway, 7th and 36th Sts., to E. F. Heim, 712 Simpson Ave., $2,689. Grand total $170,099.

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Kan, Kansas City—Concrete paving 7th St., Trafficway from Washington Ave. to Missouri Pacific Ry. tracks, to Brown Bros., Kansas City, $54,388; grading 7th St., Trafficway from Metropolitan Ave. to B. L. Stine Rd., to Roberts Constr. Co., Kansas City, $73,570.

Michigan—A. L. Burridge, div. engr., Cadillac, grading, drainage, shaping, 2 course gravel surfacing 0.667 mi. MO67-32, Contr. 1, Osceola Co., for State Hy. Comn., Lansing, to R. J. Fisher, Midland, $6,057; 10 x 14 ft. slab culvert, MO65-8C-2, Ogemaw Co., to Frank & Steihl, East Lansing, $8,321. Noted Oct. 29.

Michigan—W. J. Kingscott, div. engr., 213 Watson Bldg., Grand Rapids, grading, shaping, drainage, concrete paving 5.515 mi. MO59-27C-1, Montcalm Co. and 3.579 mi. MO34-16C-3, Ionia Co., to W. L. Thon Co., Wyandotte, $147,621 and $103,758 respectively (both incl. cement); 8 x 20 ft. slab culvert, M054-3C-2 Mecosta Co., to D. Vander Veen, Grand Rapids, $8,332, for State Hy. Comn., Lansing. Grand total $259,711.

Michigan—W. J. Kingscott, div. engr., 309 McNair Bldg., Kalamazoo, grading, drainage structures 2.667 mi. MO8-240-1 Barry and Kent Counties, for State Hy. Comn., Lansing, to R. Kebbe, 9203 Van Dyke St., Detroit, $33,438. Noted Oct. 29.

Michigan—H. G. Oakes, div. engr., Plymouth, grading, shaping, drainage structures, widening existing pavement, 10 ft. concrete paving 11.961 mi. MO63-29C-1, Oakland Co., to J. Porath, 702 Transportation Bldg., Detroit, $157,809—grading, drainage structures 10.112 mi. FO19-3, Contr. 8, Clinton Co., to A. Jeffrey, Saginaw, $108,501—6.189 mi. M030-19C-2, Hillsdale Co., to Barden & West, South Haven, $77,551, all for State Hy. Comn., Lansing, Grand total $343,861. Noted Oct. 22.

Michigan H. G. Oakes, div. engr., Plymouth, grading, shaping, drainage, widening existing 18 ft. concrete pavement to 40 ft., 2.518 mi. FO81-25C-1, Washtenaw Co., to W. H. Knapp, Monroe, $68,026 incl. cement; 27 ft. T-beam culvert, concrete paving 0.041 mi. MO50-26C-1, Macomb Co., to T. E. Currie, 909 Transportation Bldg., Detroit, $7,700, for State Hy. Comn., Lansing. Noted Oct. 29.

Michigan—J. T. Sharpensteen, div. engr., Escanaba, to Fitzpatrick & Gatiss, Munising, grading, drainage structures 1.42 mi. FO55-2, Contr. 3, Menominee Co., $17,709; 2.973 mi. FO42-13C-1, Keweenaw Co., $43,403; grading, shaping, drainage, 2 course gravel surfacing 4.579 mi. MO22-27C-1, Dickinson Co., $80,480 (incl. cement), for State Hy. Comn., Lansing. Grand total $141,592. Noted Oct. 29.

Michigan—At office City Clerk, Cheboygan, grading, shaping, drainage, concrete paving 1.695 mi. FO16-19C-2 and 0.824 mi. MO16-19C-2, Cheboygan Co., for State Hy. Comn., Lansing, to R. R. Scott Co., Saginaw, $52,802 and $19,220 (incl. cement) respectively.

Neb., McCook—City Council grading, concrete paving East 6th St., to McCook Cement & Stone Co., McCook, $39,353.

Nevada—State Hy. Comn., Carson City, grading, drainage, surfacing 9.8 mi. road between Lahontan and Leeteville, Churchill Co., to Mahoney-Cline Co., Las Vegas, $50,549. Noted Oct. 29.

New York—A. W. Brandt, comr. Hys., Albany, concrete paving 2.46 mi. Chenango Co., to F. Lewis & Sons, Inc., Bainbridge, $86,400; est., $120,949—3.3 mi. Albany Co., to Sheehan Contg. Corp., 445 2nd St., Albany, $114,604; est., $176,360—4.58 mi. Westchester Co., to Columbia Eng. & Contg. Co., 401 Bway., New York, $283,874; est. $441,119—6.05 mi. Herkimer Co. and 7.05 mi. Orleans Co., to Arborio Road Constr. Co., Inc., 525 Main St., Hartford, Conn., $209,217 and $229,677 respectively; est., $297,045 and $361,675 respectively—10.45 mi. Rensselaer Co., to S. A. Sculle, Inc., Cohoes, $456,685; est.:, $686,809—4.69 mi. Dutchess and Putnam Counties, to J. Arborio, Inc., West Cedar St., Poughkeepsie, $214,201; est., $307,705—3.58 mi. Nassau Co., to Westchester Constr. Co., New Highway, Farmingdale, $237,832; est., $317,431—bituminous macadam penetration method paving 0.67 mi. Delaware Co., to Pallette & Santos, Amsterdam, $40,161; est., $50,537—10.39 mi. Sullivan Co., to O. P. Williams Constr. Co., Inc., Oneonta, $596,700; est., $949,053—grading structures, 1.34 mi. Queens Co., to Inter County Constr. Corp., Rye., $167,053; est., $228,570—5.21 mi. Franklin and St. Lawrence Counties, to D and C Constr. Co., Fitchburg, Mass., $237,523; est., $304,774. Grand total, $2,873,927. Rejected bids Sept. 8, concrete repaving 3.5 mi. Middle Neck Rd., Hy. 9019, Nassau Co.

New York—Dpt. P. Wks., Div. Hys., Albany, bituminous macadam paving 8.05 mi. New York World War Veterans' Memorial Hy. (Wilmington-Mt. Whiteface) Essex Co., to Hagadorn Constr. Co. of West Virginia, Inc., Brookville, Pa., $687,573; est., $972,243. Noted Oct. 22.

Tex., Brownsville—At office H. M. Skelton, aud., Cameron Co., concrete paving 8.8 mi. San Benito-Hollybeach Hy., 16 and 9 ft., to R. W. Briggs & Co., Pharr, $97,449.

Tex., El Paso—City, c/o City Secretary, permanent paving 40 blocks business and residential streets, to West Constr. Co., Two-Republics Bldg., $140,515. Noted Oct. 15.

Virginia—State Hy Dpt., Richmond, concrete surfacing 3 mi. road in Fairfax Co., to Virginia Constr. Co., Clarendon, $75,944—0.36 mi. Warwick Co., to Virginia Eng. Co., Newport News, $5,042—1.3 mi. Northampton Co., to Brook Constr. Co., Norfolk, $27,896—macadam surfacing 2.8 mi. Smyth Co., to T. W. Commann, Norton, $41,895—grading, drainage structures 1.4 mi. Wise Co., to W. R. Wilson, Big Stone Gap, $9,338—box culvert in Spotsylvania Co., to Perkins-Barnes Constr. Co., Blackstone, $2,312. Grand total $161,427. Noted Oct. 29.

Ont., Toronto—To Rayner Constr. Co., Ltd., 159 Bay St., earth grading, asphalt paving Bayview Ave., Contr. A, $26,733; Contr. B, $27,376; Contr. C, $25,549. Grand total $79,658.

EXCAVATION, DRAINAGE, IRRIGATION, LEVEES, RIVER AND HARBOR

PROPOSED WORK

N. J., Belmar—Boro dredging Silver Lake, also concrete steps and parking space. $21,000. C. Birdsall, F St., engr.

Ore., New Cornucopia—L. R. Stockman, engr., Baker, bids in spring, 85 ft. dam and reservoir; 300 ft. tunnel, irrigation in upper Pine Valley, for Pine Valley Irrigation Dist., Baker. $75,000-$100,000.

Ont., Belleville—City Council soon takes bids retaining wall, other improvements along river front. $87,500.

CONTRACTS AWARDED

La., New Orleans—Bd. Levee Comrs. New Orleans Dist., 606 Common St., A. L. Shushan, pres., 3,000 ft. drainage canal in Zone 4 to Lakefront Development, and discharging at north end Peoples Ave. Canal, incl. 7,500 cu.yd. excav., to H. P. and J. F. Egan, 4330 Canal St.

Mass., Revere—Metropolitan Dist. Comn., 20 Somerset St., Boston, shore protection Revere Beach Reservation, incl. 2,000 cu.yd. excav., 3,500 cu.yd. rein.-con. masonry, 300,000 lb. steel reinforcement, to M. McDonough Co., Broadway, Malden, $41,540.

Bond Elections

Coming Bond Elections

Water Softening Plant—Wichita, Kan., Dec. 8, $1,000,000.
Ballard Bridge—Seattle, Wash., March, $1,600,000.
Light and Power Plant—Milford, Ia., Nov. 30, $80,000.
Light and Power Plant—Villisca, Ia., Dec. 7, $150,000.

Bonds Voted

Replacing Water Mains—Tooele, Utah, $50,000.
Fill in Lateral Canal and Street Work—Ottawa, Ill., $100,000.
River Terminal—Fayetteville, N. C., $65,000.
Schools—Wickliffe, O., $175,000.
Auditorium—Huron, S. D., $200,000. M. F. Wold, Aud.

Bonds Defeated

Water System—Williamstown, W. Va., $20,000.
School Add.—Raritan, N. J., $150,000.

FEDERAL GOVERNMENT

PROPOSED WORK

Calif., Sacramento—FLOOD CONTROL LEVEES—U. S. Eng., California Fruit Bldg., flood control levees in American River. To exceed $25,000.

Del., Laurel—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office. $60,000 to be appropriated.

Del., Newark—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office. $60,000 appropriated.

Del., New Castle—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office. $60,000 to be appropriated.

Del., Reedy Island—POST OFFICE—Treas. Dpt., at office Sup. Archt., Wash., D. C., U. S. Post Office at quarantine station. $14,500 appropriated.

Del., Seaford—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office. $60,000 to be appropriated.

Del., Wilmington—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office. $1,600,000 to be appropriated.

Fla., Tampa—DREDGING—U. S. Eng., Jacksonville, 523,000 cu.yd. other than rock and 78,000 cu.yd. rock in Sparkman Channel, Tampa Harbor. Noted Mar. 12.

Ill., Lake Forest—POST OFFICE—Treas. Dpt. at office Sup. Archt., tenative sketches by Milman & Morphett, Lake Forest, rein.-con., brick, stone on 120 x 145 ft. site, Market Sq.

Ill., Oak Park—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., sketches by White & Weber, 820 Tower Court, Chicago, rein-con., brick, stone, Lake St. and Kenilworth Ave.

Federal Government (Continued)

Ill., Wheaton—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans by A. N. Rebori, c/o Rebori & Wentworth, Wheaton, 161 x 189 ft. concrete, brick, stone, Wesley St. and Wheaton Ave.

La., Alexandria—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., bids in January, U. S. Post Office. $275,000. E. F. Nield, Shreveport, archt. Noted Oct. 8.

La., Baton Rouge—POST OFFICE, etc.—Treas. Dpt. at office Sup. Archt., Wash., D. C., bids in December, rein.-con., brick, stone post office and federal building, Florida and St. Anthony Sts. $465,000 M. H. Goldstein, Amer. Bank Bldg., New Orleans, archt. Noted June 4.

La., Monroe—POST OFFICE—Treas. Dpt. at Office Sup. Archt., plans by J. W. Smith & Associates, Ouachita Natl. Bank Bldg., and J. A. Wetmore, acting superv. archt., c/o owner, 3 story, basement, brick, steel, stone, Jackson and Grammont Sts. $390,000. Noted Sept. 10.

Md., Cambridge—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office. $50,000 to be appropriated.

Md., Chestertown—POST OFFICE — Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office. $75,000 to be appropriated.

Md., Crisfield—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office. $105,000.

Md., Elkton—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office. $75,000 to be appropriated.

Miss., Hattiesburg—POST OFFICE—Treas. Dpt. at office Sup. Archt., concrete, brick, stone, West Pine and Forrest Sts. $245,000. Noted Apr. 16.

N. J., Englewood—POST OFFICE—Treas. Dpt. at office Sup. Archt., sketches by L. C. Licht, 4 Dean St., and J. A. Wetmore, superv. archt., Treas. Dpt., Wash., D. C., 2 story, basement, brick, steel, West St. and Fallman Pl. $280,000. Noted Oct. 1.

N. J., West New York—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., revised sketches 2 story, basement, brick, steel post office, Van Buren Pl., Madison and 17th Sts. $375,000. Noted Feb. 26.

New York—DREDGING—U. S. Eng., Central Bldg., Buffalo, dredging in St. Lawrence River. $90,000 appropriated.

N. Y., Hempstead—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., bids late in December, general contract U. S. Post Office, High St. and Fulton Ave. $150,000. Tooker & Marsh, 101 Park Ave., New York, archts. Noted Sept. 3.

N. Y., Oswego—DREDGING—U. S. Eng., Central Bldg., Buffalo, dredging in Oswego Harbor. $50,000.

O., Canton—POST OFFICE—Treas. Dpt. at office Sup. Archt., plans by C. E. Firestone & L. M. Christman, Renkert Bldg., 2 story, brownstone post office. $725,000.

O., New Richmond — LOCKKEEPERS' HOUSES—U. S. Eng., Cincinnati, three 1 story, frame lockkeepers houses at U. S. Lock and Dam 35, on Kentucky bank of Ohio River, ¾ mi. below here.

Wash., Yakima—RECLAMATION WORK—Bureau Reclamation, Denver, Colo., final survey Raoz unit. Yakima Reclamation Project. W. L. Rowe, Denver, Colo., staff engr. in charge.

BIDS ASKED

Ala., Montgomery—APRONS—Dec. 11, by Con. Q.M. Maxwell Field, rein.-con. aprons, drains at Maxwell Field; adv. E.N.-R. Nov. 26.

Ala., Montgomery—LIGHTING SYSTEM—Dec. 10, by Con. Q.M. Maxwell Field, installing night lighting system, at Maxwell Field; adv. E.N.-R. Nov. 26.

Conn., New London—POST OFFICE—Dec. 14, by Treas. Dpt. at office Sup. Archt., Wash., U. S. Post Office. Noted Oct. 1

D C., Wash.—LIBRARY—D. Lynn, archt., Capitol, bids about Dec. 1, addition to library of Congress. Noted July 16.

Ga., Albany—REMODELING, etc.—Dec. 9, by Treas. Dpt. at office Sup. Archt., Wash., D. C., remodeling, enlarging U. S. Post Office; adv. E.N.-R. Nov. 26.

Ga., Savannah—DREDGING—Dec. 8, by U. S. Eng., 48,600-55,800 cu.yd. channel between Baileys cut of Latilla River and Dover Creek.

Ill., Maywood—POST OFFICE—Dec. 11, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office; adv. E.N.-R. Nov. 26.

Ind., Vincennes—APPROACH—Dec. 22, at office Bennett, Parsons & Frost, archts., 80 East Jackson Blvd., Chicago, Ill., bridge approach and pylons for George Rogers Clark Memorial, for George Rogers Clark Sesquicentennial Comn., C. B. Coleman, executive secy.; adv. E.N.-R. Nov. 26. Noted Nov. 19.

Mont., Butte—EXTENDING, etc.—Dec. 23, by Treas. Dpt. at office Sup. Archt., Wash., D. C., extending, remodeling (except elevators) U. S. Post Office and Court House; adv. E.N.-R. Nov. 26.

Neb., Beatrice—POST OFFICE—Dec. 16, by Treas. Dpt. at office Sup. Archt., extending, remodeling U. S. Post Office; adv. E.N.-R. Nov. 26. Noted Aug. 6.

Nev., Boulder City—RESIDENCES—Dec. 4, by Bureau Reclamation, Las Vegas, seventeen 3 room and twelve 4 room cottages, concrete found. Walker Young, Las Vegas, resident engr.

New Jersey—DREDGING—Dec. 10, by U. S. Eng., Wilmington, Del., 95,300 cu.yd. materials from Raccoon Creek; adv. E.N.-R. Nov. 26.

N. J., Phillipsburg—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., bids about Jan. 15, general contract 2 story, basement U. S. Post Office, Hillcrest Blvd. and Morris St. $155,000.

N. J., Somerville—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., bids about Jan. 15, general contract 1 story, basement U. S. Post Office, Division and South Sts.

N. Y., Brooklyn—CONDUIT, etc.—Dec. 2, by Signal Supply Officer, Army Base, 58th St. and 1st Ave., conduit sleeves.

N. Y., Brooklyn—TRANSFORMERS, etc.—Dec. 4, by Signal Supply Officer, Army Base, 58th St. and 1st Ave., transformer, capacitor, rheostat rotor, wire.

Okla., Okmulgee—POST OFFICE—Dec. 28, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office; adv. E.N.-R. Nov. 26. Noted Oct. 1.

Pa., Clearfield—POST OFFICE—Dec. 14, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office; adv. E.N.-R. Nov. 26. Noted July 2.

Pa., Pittsburgh—DAM—Dec. 21, by U. S. Eng., Pittsburgh, constructing Dam 4, Monongehela River; adv. E.N.-R. Nov. 26.

Wash., Oroville—INSPECTION STATION—Dec. 29, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Inspection Station; adv. E.N.-R. Nov. 26.

Wis., Alma—LOCK—Dec. 17 (extended date), by U. S. Eng., 615 Commerce Bldg., St. Paul, Minn., main lock and portion auxiliary lock for lock and dam in Mississippi River, near here; adv. E.N.-R. Nov. 26. Noted Oct. 29.

Wis., Beloit—EXTENDING, etc.—Dec. 18, by Treas. Dpt. at office Sup. Archt., extending, remodeling U. S. Post Office; adv. E.N.-R. Nov. 26. Wash., D. C.

CONTRACTS AWARDED

Ark., North Little Rock—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., U S Post Office, to McGregor-Pickett, A.O.U.W. Bldg., Little Rock, $694,540. Noted Oct. 22.

Calif., Berkeley—REMODELING, etc.—Treas. Dpt. at office Sup. Archt., Wash., D. C., remodeling, extending U. S. Post Office, to K. E. Parker Co, San Francisco, $105,000. Noted Oct. 8.

Ill., Rock Island—METAL WORK—U. S. Eng., fabricating metal work for 24 Poiree Dam, trestles with stringers, braces, and bolts for Lock and Dam 15, on Mississippi River, to Bedford Fdry. & Machine Co., Bedford, Ind., $5,702.

Missouri—CLUMP DIKES—U. S. Eng., 700 Postal Telegraph Bldg., Kansas City, 6,600 ft. dike at Miami, DeWitt and Brunswick Bends, to Kansas City Bridge Co., 510 Orear Leslie Bldg., Kansas City, $169,282; 9,365 ft. dikes, at Chamois Reach and Chamois Bend, to Bilhorn, Bowers & Peters, Railway Exch. Bldg., St. Louis, $274,027. Noted Oct. 22.

Mo., Lebanon—POST OFFICE—Treas. Dpt. at office Sup. Archt., 1 story, basement, brick, stone, concrete, to Kellogg & Anderson, Sedalia, $52,810. Noted Oct. 22.

Neb., Broken Bow—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to Parsons Constr. Co., 219 Grain Exch. Bldg., Omaha, Neb., $47,487. Noted Oct. 29.

N. Y., New York—DREDGING—U. S. Eng., Army Bldg., 39 Whitehall St., 1,171,900 cu.yd. in anchorage channel, Upper Bay, New York Harbor to National Dredging Co., 233 Bway., $193,246. Noted Oct. 8.

N. C., Greenboro—ELEVATOR—Treas. Dpt. at office Sup., Archt., Wash., D. C., elevator in U S. Post Office, to Otis Elevator Co., 810 18th St., Wash., D. C., $23,613. Noted Nov. 19.

Tenn., Memphis—LEVEE—U. S. Eng., 125,000 cu.yd. levee in White River, Levee Dist., to Lynch Bros., 6200 North Claremont Ave., Chicago, Ill., $29,250.

Utah, Nephi—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office, to Berntsen Bros, Salt Lake City, $52,000. Noted Oct. 22.

Va., Norfolk—CLEARING SITE—Treas. Dpt. at office Sup. Archt., Wash., D. C., clearing site for U. S. Post Office, to E. L. Meyers, Norfolk. Noted Nov. 5 Daily.

RAILWAYS

PROPOSED WORK

Illinois—New York Central R.R. Co., 466 Lexington Ave., New York, F. B. Freeman, ch. engr., large classification yard in new industrial district 47th and Crawford Ave., Chicago.

Illinois—See "Grade Crossing under Danville."

Texas—Texas & New Orleans Ry. Co., subsidiary Southern Pacific Ry. Co. (lines in Texas and Louisiana), R. W. Barnes, ch. engr., San Antonio, plans constructing and connecting up for new railway line between San Antonio to San Angelo, incl. grades, bridging, stations, track-laying and appurtenances. $3,000,000. Rail-laying by own forces. West Texas Ry. Co. will operate line.

CONTRACTS AWARDED

New York—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., Long Island City, relocating tracks on Queens Blvd., from 68th St. to Grand Ave., Long Island City, to Eastern Contg. Co., 110 West 40th St., New York, $32,070. Noted Oct. 15, under "Streets and Roads."

Texas—See "Proposed Work."

Texas—Atchison, Topeka & Santa Fe Ry. Co., c/o M. J. Collins, purch. agt., Chicago, Ill., W. W. Kelly, ch. engr., (Western Lines) Amarillo, furnishing 31,562 tons steel rails for physical improvements to road bed, to Colorado Fuel & Iron Co., Continental Oil Bldg., Denver, Colo.; 5,412 tons, to Illinois Steel Co., 208 South La Salle St., Chicago, Ill.; 5,412 tons, to Inland Steel Co., 33 South Clark St., Chicago, Ill.

SUBWAYS AND TUNNELS

PROPOSED WORK

N. Y., Brooklyn—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, 8.4 mi. 4 track subway from Palmetto Ave. to 78th St., Glendale. $17,300,000. **Maturity in spring.**

N. Y., New York—Bd. Transportation, J. H. Delaney, ch., 250 Hudson St., plans 32 mi. track for subway under 2nd Ave., from Houston St. to Harlem River, incl. 4 tracks to 61st St.; 7 tracks to 125th St. and 4 tracks to Harlem River. Plans for test borings in progress. Project will mature after February. Funds available when needed. $87,600,000. Item published in Nov. 19 issue under "Contracts Awarded" through error.

N. Y., New York—Bd. Transportation, J. H. Delaney, ch., 250 Hudson St., plans completed and funds appropriated, bids early in summer 6th Avenue Subway, from 4th to 53rd Sts. $30,000,000. Project held up at request Bd. Water Supply, pending completion of aqueduct. Items published in Nov. 19 issue under "Contracts Awarded" through error.

N. Y., Whitestone and College Point—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, 2 track subway under Roosevelt Ave., 149th St. to 11th Ave. and 122nd St. $6,000,000. Test borings and preliminary work soon. **Maturity in spring.**

GRADE CROSSINGS

PROPOSED WORK

Ill., Danville—Chicago & Eastern Illinois R.R. Co., 332 South Michigan Ave., Chicago Ill., J. S. McBride, ch. engr., Wabash Ry. Co., Exch. Bldg., St. Louis, Mo., W. R. Bennett, ch. engr., and Cleveland, Cincinnati, Chicago & St. Louis R.R. Co., 230 East 9th St., Cincinnati O., H. Baldwin, ch. engr., track elevations, and subway under tracks at East Seminary St. W. E. Martin, engr.

Ind., South Bend—Chicago, South Shore & South Bend R.R. Co., R. M. Feustel, pres., Chicago, Ill., and New York Central R.R. Co., R. O. Rote, ch. negr. (West of Buffalo Lines), St. Clair Ave. and West 3rd St., Cleveland, O., will each construct underpasses at Bendix Dr. **Maturity soon.**

N. Y., Alden—Lehigh Valley R.R. Co., G. T. Hand, ch. engr., 143 Liberty St., New York, soon take bids eliminating grade crossing. To exceed $40,000.

N. Y., Rotterdam—Boston & Maine R.R. Co., W. J. Backes, ch. engr., Boston, Mass., soon takes bids eliminating crossing at Patersonville Hy. To exceed $40,000.

CONTRACTS AWARDED

Ia., South Bend—Grand Trunk Western R.R. Co., J. A. Heaman, ch. engr., Detroit, Mich., grade separation at Walnut St., to Hamer-Paskins Constr. Co., Chicago, Ill. Est. $500,000.

N. J., Elizabethport—Central Railroad of New Jersey, A. E. Owen, ch. engr., Jersey City, constructing abutments, retaining walls, embankments in connection with elimination grade crossing, to J. Rich Steers, Inc., 30 Haynes Ave., Newark, $72,500.

N. Y., Whitehall—Delaware & Hudson R.R. Co., J. MacMartin, ch. engr., Albany, eliminating grade crossings at Boardman, Main, Church and Bellamy Sts., to Hecker-Moon Co., 8701 Union St., Cleveland, O. Noted Oct. 15.

Tex., Dallas—Union Terminal Co., Houston St., Corinth St., Underpass, direct approach to new viaduct over Trinity River, to T. H. Johnson, North Texas Bldg., $160,270 exclusive of paving to be separate. Noted Oct. 22.

Wisconsin—State Hy. Comn., Madison, Sterling Overhead Crossing in Washington Co. and Schultz Overhead Crossing, Columbia Co., to F. D. Hayes, Jonesville, $39,886 and $25,440 respectively; Eland Junction Overhead Crossing, Shawano Co., to C. R. Meyer & Sons Co., Oshkosh, $11,847. Darian Approaches, Walworth Co., to Kopplin & Williams, Green Lake $17,163; Appleton Subway Approach, Outagamie Co., to Dieckman Constr. Co., Kiel, $25,101; Shawnee Avenue underpass approach, Brown Co.; to F. Van Nelson, Green Bay, $41,991; Husher Grade separation approaches, Racine Co., to R. Van Vechtern, Wauwatosa, $16,716; Roberts Overhead Crossing, St. Clair Co., to J. E. Hinman & Son, Glenwood City, $21,231; East Forest Junction Overhead, Calumet Co., to J. E. Boston, Green Bay, $15,314. Grand total $214,689.

DAMS

PROPOSED WORK

Mass., Worcester—See "Waterworks."

AIRPORTS

CONTRACTS AWARDED

Conn., East Haven (br. New Haven)—Viking Flying Boat Co., c/o M. Linenthal, engr., 250 Devonshire St., Boston. 1 story, 85 x 100 ft., steel airplane hangar, 1 and 2 story, 26 x 100 ft., brick, stucco shop, office, to National Constr. Co., 152 Temple St., New Haven. Noted Nov. 12.

POWER AND LIGHTING

PROPOSED WORK

Pa., Cresson—Commonwealth of Pennsylvania, Dpt. Health, Cresson State Sanitarium, State Dist. 3, c/o G. T. Titzel, Butler, gas mains, water lines, boiler and stoker. $50,000. C. A. Blatchley, Drexel Bl., Phila., Pa., engr.

Sask., Regina—Saskatchewan Power Comn, soon takes bids 125,000 hp., power development on Saskatchewan River, near La Corne, $12,207,135. H. G. Acres Ltd., Niaraga Falls, Ont., engrs.

BIDS ASKED

Ind., Decatur—Dec. 1, by City Council (1st unit) power distribution system, incl. poles, wire, equipment. $15,000. Froelich & Emery, 2nd Natl. Bank Bldg., Toledo, O., engrs.

Ia., Audubon—See "Contracts Awarded."

Kansas—See "Contracts Awarded."

CONTRACTS AWARDED

Ill., Chicago—See "Unclassified."

Ia., Audubon—Iowa Pub. Serv. Co. will install natural gas distribution system, own forces. $51,000. Private plans.

Kansas—Kansas Pipe Line & Gas Co., Salina, E. R. Duree, genl. mgr., installing natural gas distribution systems in towns of Macksville, Balpre, Seward, Claflin, Bushton, Holyrood, Beverly, Tescott, Delphos and Miltonvale, distribution systems in each town range from 0.5 to 6 mi. or making total of about 38 mi. 2 in. gas line supply to be taken from 26 in. line of Missouri Valley Pipe Line Co. between Clifton and Mullinville, own forces. $120,000. Private plans. Noted Nov. 19.

PARKS AND SPORTS

PROPOSED WORK

Mass., Norwood—See "Public."

Mass., Norwood—Town, C. A. Bingham, mgr., sketches by McLaughlin & Burr, 88 Tremont St., Boston, 2 story, brick, recreation building, incl. gymnasium, squash courts, locker rooms, boiler plant, municipal auditorium.

Miss., Jackson—Millsaps College plans by H. N. Austin, gymnasium. $75,000.

N. J., Menlo Park—Edison Park Comn., R. Lyons, 275 Sanford St., New Brunswick, public park for Edison Memorial. Noted Nov. 19 under "Unclassified."

N. Y., Brooklyn—See "Stores."

Ont., Peterboro—City Council soon takes bids bathing pool, beach sewers. $100,000.

Ont., Sarnia—Sarnia Curling Club, C. A. White, pres., 209 North Vidal St., new arena with artificial ice plant. Architect not appointed.

BIDS ASKED

New York—Dec. 1, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., Brooklyn, improving playgrounds adjoining P.S. 27, 122nd St. and 14th Ave., College Point; P.S. 41, 35th Ave. and 214th St., Bayside; P.S. 69, Polk Ave. and 77th St., Jackson Heights, all Queens Boro, for Bd. Educ., 500 Park Ave., New York.

N. Y., New York—Dec. 1, by Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, heating coils in palm house, tropical house and fern house of greenhouses in Central Park, 5th Ave. and East 104th St.; wading pool, appurtenances, Carmansville Playground; concrete walks, Corlear's Park, South, Jackson, Cherry and Corlears Sts.; repairing playground building and 2 pergolas Hamilton Fish Park, Pitt St. between Houston and Willetts Sts.; constructing field house, in Morningside Park.

CONTRACTS AWARDED

Okla., Oklahoma City — Oklahoma Coliseum Co., c/o W. R. Martineau, secy., 1 story, 180 x 204 ft., rein.-con., steel coliseum, plain found., to W. S. Bellows, Herskowitz Bldg., $93,550. Est. $100,000.

Wis., Milwaukee—Bd. Educ., cement concrete for north stadium, to W. Rischmans Sons, 5375 North 43rd St., $4,480; masonry, to S. Czaplewski & Sons, 2136 South 7th St., $37,783; cut stone, to C. W. Quigley, 2062 North 31st St., $7,838; steel, ornamental iron, to Acme Iron & Steel Co., 5329 West State St., $6,885; sheet metal, to Reinke & Reinke, 904 North Market St., $3,894. Grand total $60,880.

HEATING AND VENTILATING

BIDS ASKED

N. Y., Dongan Hills—Dec. 2, by J. G. W. Greeff, comr. Hospitals, Municipal Bldg., New York, steam heating system from power plant to Cottages A, B, C and D, at Sea View Hospital. Sibley & Fetherston, 205 East 42nd St., New York, archts.

CONTRACTS AWARDED

Ark., Benton—Farm Colony, State Hospital for Nervous Diseases c/o Arkansas Constr. Comn., T. Davis, secy., Room 207 Marion Hotel, Little Rock, boiler house, to W. Peterson, Donaghey Bldg., Little Rock; chimney, to Rust Eng. Co., Woodward Bldg., Birmingham, Ala. Action on boilers and water lines deferred. Noted Oct. 1.

N. J., Trenton—Dpt. Institutions & Agencies, State Office Bldg., new heating plant in Trenton Armory, to Burns, Lane-Richardson, Adams Ave., $39,887.

N. Y., Dongan Hills—J. G. W. Greeff, comr. Dpt. Hospitals, Municipal Bldg., renewing steam conduits at New York City Farm Colony and Seaview Hospital, to R. W. Baylor, 6311 5th Ave., Brooklyn, $19,063.

UNCLASSIFIED

PROPOSED WORK

La., Monroe—FISH HATCHERY—State Conservation Dpt., New Orleans, plans by S. E. Huey, Monroe, fish hatchery. $25,000.

Mass., Saugus—TERMINAL—Saugus Dock Comn., Town Hall, freight terminal. A. Suck, 94 Arlington St., Hyde Park, engr.

N. Y., Brooklyn—STATION FINISH WORK —Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, rejected bids Oct. 23, station finish work for Smith-9th St. and 4th Ave. Stations, Rapid Transit R.R. Noted Oct. 15.

BIDS ASKED

Mass., Springfield—CAMP—See "Contracts Awarded."

N. J., Irvington (br. Newark)—SCALE PIT, etc.—Lehigh Valley R.R. Co., foot Washington St., Jersey City, taking bids general contract 1 story scale pit and scale shed extension. $40,000. Private plans.

N. Y., Auburn—TUNNELS—Dec. 3, by Commissioner Correction, State Office Bldg., Albany, tunnels at Auburn State Prison.

N. Y., Brooklyn—BULKHEAD—Dec. 4, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, bulkhead, foot North 7th St. Agreement "KO."

N. Y., Hudson—DAIRY BARN—Dec. 3, by Superintendent Div. Standards, State House, Albany, dairy barn, store house, at New York State Training School for Girls.

CONTRACTS AWARDED

Ill., Chicago—LAND DEVELOPMENT—New York Central R.R. Co., 466 Lexington Ave., New York, F. B. Freeman, ch. engr., developing 400 acre industrial site, incl. streets, sewers, water and gas systems, power and lighting circuits, 47th St. and Crawford Ave., to Central Mfg. Dist., 2001 West Pershing Rd.

Mass., Springfield — CAMP — International Y.M.C.A. College, 287 Hickory St., camp, incl. 72 x 140 ft. headquarters building, 18 x 20 ft. lodge and 15 x 16 ft. sanitary building, all brick, timber, separate contracts. $25,000. Private plans.

N. Y., Springville—ANIMAL HOUSE—Commissioners Health, State Office Bldg., Albany, animal house, to Haas Constr. Co., Jamestown, $15,701; heating and sanitary work to Fish & Kronenberg, Inc., Hamburg, $4,100 and $1,530, respectively—electrical work to W. H. Gottburg, Rochester, $363. Grand total $21,694. Noted Sept. 3, under "Heating and Ventilating." Awarded Oct. 30.

Tex., San Antonio—TOURIST COURTS—Mira Flores Tourist Courts, c/o M. M. Berry, San Antonio, (1st unit) tourist courts, containing 35 individual apartment units, 1 and 4 rooms each, tile, stucco, semi-fireproof, incl. installation utilities, etc., plain founds. Broadway and Hildebrand Sts. $175,000. Owner builds, taking sub-bids; materials. N. Straus Nayfach, c/o Frost Bldg., archt.

MATERIALS

BIDS ASKED

CAST IRON PIPE, TEES, etc.—**Brea, Calif.** —Dec. 2, by G. L. May, city clk. 10,000 lin.ft. 4 in. and 3,500 lin.ft. 6 in. Class B c.i. pipe, two 6 x 4 x 6 tees, eight 6 x 6 x 4 tees, twenty-four 4 x 4 x 4 tees one 6 x 4 reducer, two 90 degree ells, 4 in., two 45 degree ells, 4 in., f.o.b. nearest railroad or water terminal to city of Brea.

LIQUID ASPHALT—**Florida**—Dec. 7, by State Rd. Dpt., Tallahassee, B. M. Duncan, state hy. engr., 490,000 gal. liquid asphalt for sand asphalt base and surface course construction, f.o.b. barges alongside of road at points to be designated by engineer, between Panama City and Choctawhatchee River, Project 688, Road 10, Bay Co.; 188,000 gal. f.o.b. cars Lynn Haven Junction or f.o.b. barge Lynn Haven, Project 10, Rd. 158, Bay Co.

ROAD MATERIALS—**Florida**—Dec. 7, by State Road Dpt., Tallahassee, 120,000 gal. T-C-1 Prime at various points for Projects 868 and 868 Rd. 5, Levy Co. B. M. Duncan, state hy. engr.

LUMBER, etc.—**Allison, Ia.**—Dec. 9, at office Auditor Butler Co., 26,000 B.F. treated lumber, 30,000 B.F. untreated lumber, Class B, 10,000 B.F. untreated lumber Class A, 15,000 B.F. finished lumber Class C. Address County Engineer or Auditor.

LUMBER, etc.—**Council Bluffs, Ia.**—Dec. 2, at office Auditor Pottawattamie Co., 544,465 ft. B.M. untreated fir lumber, 2,132 ft. B.M. untreated white pine lumber, 40,167 ft. B.M. creosoted southern pine piling, 6,032 lin.ft. corrugated culvert pipe. Address County Engineer or Auditor.

ENGINE — **Manilla, Ia.** — Dec. 7, by City Council, multi-cylinder, 4 cycle air injection Diesel oil engine. R. W. Barber, city clk.

LUMBER, etc.—**Sigourney, Ia.**—Dec. 7, at office Auditor Keokuk Co., lumber, piling, culvert pipe. Address County Auditor or Engineer.

CHLORINE—**New York, N. Y.**—Nov. 30, by M. G. Kenney, deputy and acting comr. Purchase, Municipal Bldg., liquid chlorine to Dpt. Sanitation.

CONTRACTS AWARDED

CAST IRON PIPE—**Lansing, Mich.**—City, 7,100 lin. ft. 16 in. and 60 ft. 14 in. c.i. pipe for east side pressure main, to R. D. Wood & Co., 400 Chestnut St., Phila., Pa., $11,431.

ROAD OIL, SNOW FENCE, etc.—**Nebraska**—State Hy. Dpt., Lincoln, c/o J. H. Farris, state purch. agt., 1317 State Capitol Bldg., Lincoln, 250,00 gal. road oil for use in Wheeler Co., to Skelly Oil Co., 16th and N Sts., Lincoln, at $0.04 per gal.; 521,800 ft. 4 to 6 ft. snow fence, to Nebraska Bridge Supply & Lumber Co., 448 Peters Trust Bldg., Omaha, $29,042; 37,615 posts, 6½ and 8½ ft. long, to Calumet Steel Co., 33 North La Salle St., Chicago, Ill., $8,837.

CINDERS—**New York, N. Y.**—H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., 7,500 cu.yd. cinders, to Empire Cinders Delivery Corp., East River and 59th St., $6,825. Noted Nov. 5.

EQUIPMENT

PROPOSED WORK

PUMP, etc.—**Fairmont, Ind.**—Bd. of Trustee bids about January, pump, motor, full equipment to operate well. J. R. Little, clk and treas.

BIDS ASKED

TRUNK CHASSIS—**Aitkin, Minn.**—Dec. 2, by Village, one 1½ ton truck chassis with dual rear wheels, enclosed cab and 1½ cu.yd. steel hydraulic hoist body.

GENERATING UNIT—**Iroquois, N. Y.**—Dec. 3, by Superintendent Div. Standards & Purchase, Capitol, Albany, electric generating unit with connections Thomas Indian School.

BUTT WELDER—**Cincinnati, O.**—Witt Cornice Co., 2118 Winchell St., in market modern butt welder, 220 volts, 60 cycles to weld material ½ x 2½ in. for rings 12- to 24-in. diam.

TRUCK—**Shickshinny, Pa.**—Dec. 2, by Boro, W. R. Anderson, secy., 1½ ton dump truck with hydraulic hoist, 3 ton capacity, 25 hp. with dual tires on rear.

MOTOR GRADER, etc.—**Brownsville, Tex.**— Dec. 3, by Cameron Co., c/o O. C. Dancy, judge, one 1-man motor grader equipped with 12 ft. blade, cab, solid rubber front wheels, steel crawler on rear, 21,000 lb. in weight, f.o.b. San Benito. W. O. Washington, Brownsville, engr.

OVERHEAD CRANES—**Ottawa, Ont.**—Dec. 18, by Chairman Hydro-Electric Comn., 75 Laurier Ave. W., one 30 ton and one 3 ton hand operated overhead cranes.

CONTRACTS AWARDED

GENERATOR, PUMP, etc.—**Walnut, Ia.**— City Council, general contract municipal power plant, improvements, incl. Diesel engine generator unit, motor driven pump unit, air compressor, auxiliary fuel tank, to Fairbanks, Morse & Co., 9th and Harney Sts., Omaha, Neb., $27,985.

REFRIGERATION EQUIPMENT—**St. Louis, Mo.** — Forest Park Highland Exhibition & Amusement Co., 5600 Oakland Ave., refrigerating equipment for indoor ice rink arena, 5700 Oakland Ave., to Sterling Ice Machine Co., Springfield. Est. $50,000.

GENERATOR, etc.—**McAlester, Okla.**—State Bd. Affairs, Capitol Bldg., Oklahoma City, new 100 hp. turbo-generator set for State Penitentiary, to Cook & McDonald, 627½ West 2nd St., Oklahoma City, $64,000 est. $70,000; new switchboard, to Westinghouse Co., Commerce Exch., Oklahoma City, $11,000 est. $12,500.

FOREIGN

Germany—Associated Apparel Industries, 315 4th Ave., New York, plans survey to decide on city for location clothing and apparel manufacturing and distribution plant. $200,000. **Maturity indefinite.**

South Africa, Johannesburg—Government plans irrigating 106,000 acres in Pongola Valley.

Ukrania—Ukranian Government plans 2 hydro-electric power schemes on River Boug. 38,000,000 roubles. **Maturity immediately.**

Commercial Buildings

RESIDENTIAL

(Apartments unless otherwise noted)

BIDS ASKED

N. J., North Bergen — See "Contracts Awarded."

N. Y., Long Island City—See "Contracts Awarded."

N. Y., New York—See "Contracts Awarded."

N. Y., Rockaway—See "Contracts Awarded."

N. Y., St. Albans—See "Contracts Awarded."

Pa., Pittsburgh—T. Eicholtz, archt., 411 Boulevard of Allies taking bids separate contracts, 2 story, basement, 47 x 90 ft., brick, tile, Woodland Rd., near 5th Ave., for Owner, c/o architect. $150,000.

CONTRACTS AWARDED

Ia., Sioux City—R. Coomer & K. A. Murray, 1518 Ross St., 3 story, basement, concrete, brick, stone, 17th and Nebraska Sts., to Coomer & Small, 312 United Bank Bldg. Est. $150,000.

Mo., St. Louis—Del Line Development Corp., S. C. Peterson, pres., Forsythe and Lindell Blvd., will build 3 story, basement, concrete, brick, stone, terra cotta, Oakland and Graham Aves. $150,000.

N. J., North Bergen—R. Rinaldi, 516 Robinson St., 3 story, basement, brick, steel, 48th St., separate contracts. $150,000. Private plans.

N. Y., Garden City—Spivak Bros., Willow St. near Clinton Rd., apartment, to Jomax Building Corp., c/o owner. $600,000. Contractor taking bids on separate contracts.

N. Y., Long Island City—Forty-Third Avenue Corp., 1163 Stratford St., 6 story, 85 x 195 ft., 47th Ave., from 42nd to 43rd Sts., separate contracts. $250,000. I. Crausman, 275 East Brunswick Ave., New York, archt.

N. Y., Long Island City—Schuzzano Realty Corp., 39-24 182nd St., Corona, 4 story, 33rd Ave. and 28th St., separate contracts. Wuest & Bailey, 32-02 30th Ave., archt.

N. Y., New York—I. F. Cavalluzzo, 3120 Bainbridge Ave., 6 story, 169th St. and Ogden Ave., separate contracts. $150,000. W. C. Sommerfeld, 31 Union Sq., archt.

N. Y., New York—Sterling Foundation, A. Ferman, pres., 1451 Boscobel Ave., 6 story, 70 x 97 ft. Boscobel and Jerome Aves., separate contracts. $240,000. H. Ginsberg, 205 East 42nd St., archt.

N. Y., Rockaway—Blondel Holding Corp., c/o P. Freshman, archt., 50 Court St., Brooklyn, 6 story, 75 x 170 ft., Ocean Promenade and Beach 123rd St., separate contracts. $250,000.

N. Y., St. Albans—Selective Homes, Inc., apartment, 222nd St. and 115th Rd., separate contracts. $300,000. Private plans.

N. Y., St. Albans—Tudor Constr. Co., 163-18 Jamaica Ave., Jamaica, apartment, 178th Pl. and 120 Ave., day labor and separate contracts. $150,000. A. Allen, 163-18 Jamaica Ave., Jamaica, archt.

CLUBS

PROPOSED WORK

Mass., Falmouth—Marine Lodge of Free & Accepted Masons, G. Greene, chn. Building Com., soon takes bids 3 story, basement, 60 x 100 ft., brick, stone, Masonic Temple, store, plain found., Main St. $150,000. J. S. Hutchinson, 10 Norwell Rd., Dedham, archt.

N. J., Asbury Park—Owner, c/o W. F. Kesselman, 9th Ave., Belmar, sketches 2 story, basement, 50 x 110 ft., brick, steel club house. $150,000.

N. J., East Orange—Faith of Israel Congregation, South Orange Ave., 2 story, basement, brick, steel Jewish community centre, Brookside and South Orange Aves. $150,000. Architect not appointed. **Maturity probably soon.**

N. Y., Atlantic Beach—Atlantic Beach Club, bids about December, general contract club-apartment. $150,000. J. Urban, 5 East 57th St., New York, archt. Noted Oct. 8.

Tex., Tyler—Womans Forum, c/o A. Woldert, Tyler, plans by S. Simons, 301 Citizens Bank Bldg., and takes bids about Dec. 1, brick, rein.-con club to have two 3 story, 40 x 100 ft. wings, incl. main auditorium, club rooms, dining room, plain found.

BIDS ASKED

N. J., Irvington—Owner, c/o A. Kleeman, archt., 987 Springfield Ave., bids about Jan. 15, general contract 2 story, basement, brick, steel club house, incl. gymnasium, bowling alleys, 40th St. $150,000. Noted Nov. 5.

N. J., Jersey City—Owner, c/o C. I. Goldberg, archt., 921 Bergen Ave., bids about Dec. 15, general contract 2 story, basement, brick, steel clubhouse, Fleet St. $150,000. Noted Nov. 12.

N. J., Ridgefield Park—B. F. McGuire, archt., 705 Linden Ave., Teaneck, bids about Jan. 15, general contract altering and constructing 3 story, basement, brick, steel club house addition, Bergen Ave., for Knights of Columbus, Bergen Ave. $150,000. Noted Nov. 5.

N. J., Somerville—B.P.O.E., West End Ave., bids about Dec. 15, general contract altering and constructing 1 and 2 story, basement, 75 x 150 ft. club house addition, West End Ave. $150,000. Kork, Poggi & Bragdon, 275 Morris Ave., Elizabeth, archts. Noted Nov. 19.

HOSPITALS

PROPOSED WORK

Ariz., Tombstone—Martini Damorette, Oakland, Calif., sketches tubercular sanitarium. $150,000. Architect not appointed.

N. J., Jersey City—Jewish Hospital Assn., B. S. Pollick, in charge, Laurel Hill, Secaucus, raising $150,000 or more funds, 4 story, basement, brick, steel, Fowler Ave. Architect not appointed. **Maturity indefinite.** Noted June 18.

N. J., New Brunswick—Bd. Freeholders Middlesex Co., Court House, brick, steel tuberculosis hospital, $150,000. Architect not appointed. **Maturity probably soon.**

N. Y., New York—Dpt. Hospitals, Municipal Bldg., bids late in spring, general contract nurses' home addition, Metropolitan Hospital, Welfare Island. Schwartz & Gross, 347 5th Ave., archts., Noted June 11.

N. Y., New York—Dpt. Hospitals, Municipal Bldg., bids in February, general contract nurses' home, Welfare Island. $500,000. Van Wart & Wein, 347 Madison Ave., archts.

N. Y., Otisville — Dpt. Hospitals, Municipal Bldg., New York, municipal sanatorium. $2,000,000. **Maturity soon.**

Pa., Pittsburgh—Commonwealth of Pennsylvania Western State Penitentiary, S. P. Ashe, warden, plans by H. Viehman, Chamber of Commerce Bldg., and soon takes bids 2 story, basement, brick, steel hospital, at West State Penitentiary. State Dist. 3, G. T. Titzel, Butler County Natl. Bank Bldg., Butler, engr.

Pa., Warren—Commonwealth of Pennsylvania, Warren State Hospital sketches by W. T. Monahan, Palace Hardware Bldg., Erie, brick, steel dining hall, kitchen, State Hospital. $150,000. State Dist. 3, G. T. Titzel, Butler, engr.

Ont., Hamilton—Hamilton Health Assn., W. J. Aitchison, pres., plans by Hutton & Souter, 6 James St. S., and takes bids about Dec. 15, new buildings at Mountain Sanatarium, incl. 96 bed private pavilion, 42 room nurses' home. $250,000.

BID ASKED

Ill., Quincy—Dec. 1, by C. H. Hammond, superv. archt., c/o owner, 1 story, part basement, rein.-con. brick hospital at State Soldiers and Sailors Home for State of Illinois, Capitol Bldg., Springfield. $200,000. State Div. Architects and Engineers, Capitol Bldg., Springfield, archts. Noted Sept. 17, under "Public."

N. Y., Neponsit—Dec. 8, by J. G. W. Greeff, comr. Hospitals, Municipal Bldg., New York, male dormitory, power plant, and laundry and altering main buildings, Neponsit Hospital, Rockaway Beach Blvd. and Beach 149th St. M. Bernstein, 2 Columbus Circle, New York, archt.

N. Y., Pine Aire Station—Dec. 2, by Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, farm buildings Pilgrim State Hospital.

Wis., Wauwatosa—Nov. 30, by W. L. Coffey, mgr. Milwaukee County Institutions, 4 story, basement, 160 x 180 ft., rein.-con., brick, steel nurses' home, plain found. $300,000. Van Ryn & De Gelleke, 114 Wisconsin Ave., Milwaukee, archts. Noted Nov. 26.

Pa., Torrance—Commonwealth of Massachusetts of Pennsylvania, Torrance State Hospital, C. R. McKinnis, supt., bids about Dec. 1, brick, steel dining room, kitchen. $173,618. H. H. Prack, Martin Bldg., N. S. Pittsburgh, archt., State Dist. 3, G. T. Titzel, Butler County Bank Bldg., Butler, engr. Noted Oct. 15.

CONTRACTS AWARDED

Mich., Eloise—Comrs. Wayne Co. Poor, County Bldg., Detroit, 4 story, basement, brick, rein.-con., steel infirmary building addition, plain found., Michigan Ave., to H. G. Christman-Burke Co., Fisher Bldg., Detroit, $298,000. Former contract annulled Noted Aug 1-3, under "Contracts Awarded."

CHURCHES

PROPOSED WORK

Conn., New Haven—First Methodist Episcopal Parish, Scott, Sheffield Scientific School, chn. Plans Com., church, College and Elm Sts. $250,000. Architect not appointed.

Mass., Westwood—St. Margaret Mary's Parish, W. Tierney, pastor, sketches by J. E. Kelly, 38 Chauncy St., Boston, 1 story, basement church. $150,000. Noted Nov. 19.

N. J., Hoboken—Holy Trinity Evangelical Lutheran Church, C. T. McDaniel, pastor, 204 10th St., 2 story, basement, brick, steel, 10th and Garden Sts. $150,000. **Maturity probably soon.**

N. J., Plainfield—First Presbyterian Church, L. W. Warren, pastor, 41 Sanford Ave., altering and constructing 2 story addition, East Front St. $150,000. **Maturity probably soon.**

N. J., Roselle—St. Joseph's Roman Catholic Church, 3rd Ave., 2 story, basement, brick church, $150,000. Architect not appointed.

N. Y., Richmond Hill—First Methodist Episcopal Church, H. H. DuBois, pastor, 9519 118th St., rebuilding church, destroyed by fire, 118th St. and 97th Ave. To exceed $150,000.

BIDS ASKED

N. J., Morris Plains—Presbyterian Church, 55 Park Pl., bids about Dec. 15, general contract 2 story, basement, brick, steel church. $150,000. C. L. Bolton, Schaft Bldg., Phila., Pa., archt. Noted Nov. 12.

N. J., Union—F. A. Elsasser, archt., 1000 Stuyvesant Ave., bids about Jan. 15, general contract 3 story, basement, church addition, for Owner, c/o architect. $150,000.

SCHOOLS

PROPOSED WORK

Conn., Hamden (br. New Haven)—Town, R. P. Collins, Hamden, School Comn., plans by R. Foote, 185 Church St., New Haven, brick, steel high school, Dixwell Ave. $500,000. W. R. McCormack, 10006 Carnegie Ave., Cleveland, O., consult. archt.

Conn., Portland—Town, W. Penfield, chn. building comn., soon takes bids Senior-Junior High School, 2 story, basement, 60 x 125 ft., brick, steel, $150,000. Towner & Sellew Associates, Inc., 329 Main St., Middletown, archts. Noted Nov. 5.

Conn., Windsor — Town, D. Howard, supt. schools, grade school, Stony Hill. $150,000. Architect not appointed.

La., New Orleans—Dillard University plans by M. H. Goldstein, Amer. Bank Bldg., university. $2,000,000.

Mass., Andover—Phillips Andover Academy sketches by A. W. K. Billings, Jr., 80 Boylston St., Boston, 2 story, basement, brick music building, off Salem St. $150,000 or more.

Mont. Missoula—Missoula Co. High School, R. H. Smith, plans by C. J. Forbes, Missoula, and W. Arnold, Butte, assoc. archt., rebuilding superstructure, 3 story, steel, brick school, destroyed by fire. $365,000.

N. J., Hohokus—Bd. Educ., Township Hall, 2 story, basement, brick, steel, Hollywood Ave. $150,000. **Maturity soon.** Architect not appointed.

N. J., Little Silver—Bd. Educ., 2 story, basement, brick, steel, Markham Rd. $150,000. Architect not appointed. **Maturity soon.**

N. J., Montclair—Bd. Educ., Valley Rd., plans by Starrett & Van Vleck, 393 7th Ave., addition to Spaulding School. To exceed $150,000. Noted Oct. 1.

N. J., North Plainfield—Bd. Educ., 125 Somerset St., 2 story, basement, brick, steel school. $150,000. Architect not appointed. **Maturity soon.**

N. J., Springfield—Bd. Educ. bids in January on revised sketches by J. T. Simpson, 744 Broad St., Newark, 2 story, basement, brick, steel high school, Flemer and Mountain Aves. $800,000. Noted Oct. 22.

N. Y., Cedarhurst—Bd. Educ., c/o C. S. Wright, supt., high school. $1,250,000 appropriation defeated. **Maturity indefinite.**

N. Y., New York—Bd. Educ., 500 Park Ave., printing trades school, West 41st, between 8th and 7th Aves. To exceed $1,000,000.

N. Y., New York—Children's Aid Society, W. C. Osborn, 105 East 22nd St., will award general contract in January, altering 9 story school, incl. elevators, 106 Matt St. $150,000. L. E. Jallade, 15 East 22nd St., archt. Noted Oct. 8.

N. Y., Queens Village—Bd. Educ., 500 Park Ave., New York, soon takes bids general contract P. S. 16, 5 story, 161 x 161 ft. school. $320,000. W. C. Martin, Flatbush Ave. extension and Concord St., Brooklyn, archt.

N. Y., Trenton—Bd. Educ. plans by A. F. Gilbert, 358 5th Ave., New York, school. $450,000.

Tex., Austin—University of Texas, c/o J. W. Calhoun, comptroller Austin, plans by R. L. White, University of Texas, and takes bids about Dec. 1, 3, 4 and 5 story, limestone, rubble stone, rein.-con., structural steel, tile and brick Union group, incl. students activities building, small auditorium and theatre, cafeteria and dining rooms, University Campus. $625,000. P. C. Cret, Architects Bldg., Phila., Pa., consult. archt. Matthews & Kenan, Smith-Young Tower Bldg., San Antonio, engrs. Noted July 2.

Tex., San Antonio—Bd. Educ., Lavaca and Matagorda Sts., plans by Phelps & DeWees, 628 Gunter Bldg. (Bd. Educ. Archts), and H. P. Smith, N. B. of C. Bldg., and soon takes bids Junior and Senior High School, 2 story, 70 x 120 ft., brick, rein.-con., plain found., Harrison, Burleson, Gevers and Hudson Sts. $150,000.

Ont., Willowdale—North York High School Bd., plans by Graig & Madill, 96 Bloor St. W., Toronto, 2 story, basement, brick, stone addition to Earl Haig High School. $160,000.

Schools (Continued)

BIDS ASKED

Conn., Morris—Town, W. Kirschberger, chn., plans by G. A. Quick, 170 Kneeland Rd., New Haven, and takes bids about Mar. 15, building, incl., school, library, jail, town offices and community hall. $150,000. Noted Aug. 13.

Del., Milton—Dec. 11, by Delaware School Foundation, School Building Com. for Milton Dist., c/o H. V. Holloway, Du Pont Bldg., Wilmington, 2 story, part basement, 136 x 265 ft., rein.-con., brick grade and high school. Noted Nov. 5.

Mass., Chatham—Dec. 1, by Town and McLaughlin & Burr, archts., 88 Tremont St., Boston, 2 story, basement, brick school addition, incl. gymnasium, plain found., Main St. $150,000 or more. Noted Oct. 15.

Neb., Lincoln—Dec. 1, by L. F. Seaton, operating supt. University of Nebraska, c/o State Bd. of Regents, L. F. Seaton, operating supt., 3 story, basement, central unit girls dormitory, incl. parlors, dining room, kitchen, 16th St. between S and U Sts. $269,000. Davis & Wilson, 525 South 13th St., archts.

N. J., Florham Park—Nov. 30, by Bd. Educ., R. Buck, dist. clk., 2 story, basement, brick, steel, Ridgedale Ave. $150,000. Rasmussen & Wayland, 36 West 47th St., New York, archts. Clark, McMullen & Riley, 101 Park Ave., New York, engrs. Noted Oct. 29.

N. J., Middlesex — Bd. Educ., Watchung School, Fischer Ave., bids about Jan. 15, 2 story, basement, brick, steel, rein.-con., Ramsey Lane and Virginia Ave. $150,000. J. N. Pierson, 198 Jefferson St., Perth Amboy) archt. Noted Nov. 12.

N. J., Oceanport—Bd. Educ. bids about Jan. 15, 2 story, basement, brick, steel school. $150,000. F. G. Noble, 1630 Springfield Ave., Maplewood, archt. Noted Nov. 12.

N. J., Rahway—Bd. Educ., High School, bids about Mar. 1, on revised sketches by S. Williams, 146 Irving St., Junior High School, 3 story, basement, brick, steel, Central and St. George Aves. $500,000. Noted Oct. 15.

N. Y., Mount Vernon—Dec. 14, by Bd. Educ., 60 South 3rd Ave., altering Union High School 1. $800,000. Werner & Van Alen, Chrysler Bldg., New York, archts.

N. Y., New Paltz, Dec. 10 (extended date), by Commissioner Dpt. Education, State Education Bldg., completing practice school, New York State Normal School; adv. E.N.-R. Nov. 26. Noted Oct. 29.

Pa., Pittsburgh—Bd. Educ., H. W. Cramblet, secy., Administration Bldg., bids about Dec. 1, William M. Davidson High School, brick, steel, West Liberty St. $600,000. R. M. Trimble, 709 Ferguson Bldg., archt. Noted July 9.

CONTRACTS AWARDED

Del., Selbyville—E. W. Martin, archt., Du Pont Bldg., Wilmington, 2 story, basement, 117 x 192 ft., brick, steel to F. V. Warren Co., Lewis Tower, Phila., Pa., $134,879; plumbing, heating and ventilating, to Palmer-Thackery Co, Rehoboth Beach, $27,015; electrical work, to L. W. Gundy Co., Salisbury, $5,334. Grand total $167,228 for State School Building Comn., H. V. Holloway, DuPont Bldg., Wilmington, supt. Noted Nov. 5.

Neb., Wayne—C. W. Taylor, supt. State Teachers College, State Bd. Control, 3 story, basement, 81 x 164 ft., girls dormitory, concrete, brick, to C. E. Atwater Co., 408 West Koenig St., Grand Island; heating and plumbing, to E. L. Rodwell, 1810 St. Marys St., Omaha, electric wiring, to P. E. Malmquist, 3620 North 45th St., Omaha. Est. $150,000. Noted Oct. 22.

Pa., Erie—R. Ford, representative Eagle Indemnity Co. of Cleveland, O., 419 Marine Bank Bldg., Erie, completing general contract Edison Elementary School, 2 story, basement, 95 x 171 ft., brick, stone to Upton & Lang, 1008 Commerce Bldg., for Bd. Educ., S. W. Reichard, pres., Library Bldg. Est. $185,000. Noted Nov. 5.

Wis., Oregon—State Bd. Regents, Madison, industrial school, incl. several buildings, to Permanent Constr. Co., 208 South La Salle St., Chicago, Ill. Est. $375,000.

Wis., Milwaukee—Bd. School Directors, ornamental iron for Steuben Junior High School, to A. F. Wagner Architectural Iron Wks., 1483 North Water St., $18,312; metal windows, to J. Millman, 740 Plankington Ave., $1,438; tile work, to Butler & Son Co., 724 North Milwaukee St., $11,800; soft tile, to Turner Resilient Floors, 1012 North 3rd St., $6,321; Terrazzo works, to Cofmeyer Bros., 322 West Juneau Ave., $21,543; marble and blackboards, to West Salmon Marble Co., 1536 West Pierce St., $18,490 and $4,085, respectively; elevator to F. Rosenberg Elevator Co., 3745 North Richards St., $3,198; hardware, to P. Gross Hardware Co., 822 North 3rd St., $7,314; plaster, lathing, to Walish, Dufton Co., 1729 North Water St., $60,600. Grand total, $153,101. Noted May 21.

Wis., Wauwatosa—Bd. Educ., for Junior High School, 3 story, basement, 150 x 250 ft., to Jezo Constr. Co., 1579 South 60th St., West Allis, $219,570; hardware, to P. H. Gross Hardware & Supply Co., 822 West 3rd St., $2,780; plumbing, to Wenzel & Henoch Co., 1524 North 27th St., $18,993; heating, ventilating, temperature control, to Pflugradt Co., 2405 West Grant St., $37,122. Grand total $278,465. Noted Oct. 29.

THEATRES

PROPOSED WORK

Calif., Berkeley—United Artists Theatres of California, 333 South Bway., Los Angeles, revised plans by Walker & Eisen and C. A. Balch, Western Pacific Bldg., Los Angeles, rein.-con. theatre, Shattuck Ave. $200,000. Former contract rescinded.

N. Y., New York—Alurion Realty Corp., W. T. Knight, pres., 60 Wall St., bids in February, general contract altering theatre, 254 West 42nd St. $500,000. T. W. Lamb, 570 7th Ave., archt. Noted Sept. 24.

N. Y., New York—F. H. D. Holding Corp., 309 West 23rd St., bids in February, general contract theatre, store, 261 8th Ave. $800,000-$1,000,000. T. W. Lamb, 507 7th Ave., archt. Noted Aug. 20.

OFFICES

PROPOSED WORK

N. J., Union—Aryan Holding Co., 998 Stuyvesant Ave., plans by F. A. Elsasser, 1000 Stuyvesant Ave., 2 story, basement, brick, steel, office, post office store, $150,000. Treas. Dpt. at office Sup. Archt. Wash., D. C., lessee. Noted Nov. 19.

N. Y., Jamaica—Queens Medical Arts., Inc., c/o B. Braunstein, archt., 163-18 Jamaica Ave., sketches medical arts building, Parsons Blvd. near Jamaica Ave. $650,000.

BIDS ASKED

N. J., Union—F. A. Elsasser, archt., 1000 Stuyvesant Ave.; bids about Dec. 15, general contract 2 story, basement, brick, steel office, store for Owner, c/o architect. $150,000. Noted Nov. 5.

CONTRACTS AWARDED

Mo., St. Louis—Midwest Development Co., c/o Illinois Terminal R.R. Co., L. E. Fisher, pres., 231 South LaSalle St., Chicago, Ill., founds. and footings for 10 story (ultimately 20 story), 122 x 137 ft., rein.-con., brick, steel, stone office, 125th St. and Washington Ave., to Merker & Co., 317 North 11th St. Est. $750,000 for 1st unit.

STORES

PROPOSED WORK

N. J., Elizabeth—Owner, c/o S. Cohen, archt., 130 Branford Pl., Newark, sketches 2 story, basement, brick, steel store, apartment, Magee Ave. $150,000.

N. J., Hackensack—Sears Roebuck Co., Roosevelt Blvd., Phila., Pa., department store, Main and Anderson Sts. $500,000. Bids soon for excavation work. Noted Sept. 24.

N. J., Montclair—Owner, c/o W. J. Fitzsimmons, archt., 626 Central Ave., East Orange, bids about February, 3 story, basement, brick, steel store, office, William St. $150,000. Noted Nov. 5.

N. J., Plainfield—Owner, c/o W. L. Finne, archt., 124 West Jersey St., Elizabeth, sketches 2 story, basement, brick, steel store, apartment. $150,000.

N. J., Upper Montclair—T. C. Hooton, 39 North Fullerton Ave., Montclair, 2 story, basement, brick, steel store, office, Valley Rd. $150,000. Private plans.

N. Y., Brooklyn—Long Island Storage Warehouse, Inc., Nostrand and Gates Aves., plans by H. G. Wiseman, 33 West 42nd St., store, skating rink, Coney Island Ave. and Ocean Parkway. $150,000. **Maturity about March.**

N. Y., New York—Corporation, c/o S. Lerner, 2043 Holland Ave., plans by Lilien & Lilien, 645 East Tremont Ave., store apartment, Bronxdale Ave. and Austin Pl. $325,000.

N. Y., New York—Corporation, c/o I. Robinson, 3527 Jerome Ave., plans by Goldner & Goldner, 19 West 44th St., 6 story, 79 x 112 ft. store, apartment, Taylor Ave. and 177th St. $160,000.

BIDS ASKED

N. J., Plainfield—W. Finne, archt., 124 West Jersey St., Elizabeth, bids about Dec. 15, 2 story, basement, brick, steel store, apartment, for Owner, c/o architect. $150,000.

CONTRACTS AWARDED

Ill., Chicago—Sears Roebuck Co., Arlington and South Homan Sts., remodeling department store, State and Van Buren Sts., to A. L. Jackson Co., 310 South Michigan Ave. Est. $750,000.

PUBLIC

PROPOSED WORK

La., New Orleans—ALMS HOUSE—City Council revised plans by W. R. Burk, Baltar Bldg., alms house at Algiers. $200,000.

Mass., Norwood—CIVIC—Town, C. A. Bingham, town mgr., sketches by McLaughlin & Burr, 88 Tremont St., Boston, 2 story, basement, brick civic building, incl. gymnasium, squash courts, boiler room, assembly hall, lockers. $150,000 or more.

Mass., Somerville (br. Boston)—POLICE STATION—City, Dpt. P. Buildings, 2 story, basement, brick, Union Sq. $275,000. Architect not appointed. Noted Jan. 8.

Mass., Swampscott—ADMINISTRATION, etc. —Town, G. Glidden, Town Hall, sketches by C. V. Burgess, 31 Exchange St., Lynn, administration building, memorial building and police station, all brick, Burrill St. To exceed $150,000. Noted Aug. 20.

N. Y., Brooklyn—COURT HOUSE—H. Hesterberg, pres. Brooklyn Boro, Boro Hall, supreme court building or addition. To exceed $500,000. Money not appropriated. **Maturity indefinite.**

N. Y., New York — MUSEUM — Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, bids in February or later, art museum, for Metropolitan Museum of Art, 5th Ave., 80th and 84th Sts. $3,350,000. J. R. Pope, 542 5th Ave., archt. E. E. Seely, 101 Park Ave., engr. **Maturity late in November.** Noted Sept. 10.

BIDS ASKED

Mass., Norfolk—DORMITORY—Dec. [illegible] by Commonwealth of Massachusetts, Dpt. Correction, State House, Boston, 3 story, basement 40 x 275 ft., brick, concrete dormitory, concrete found., at State Prison Colony. $17[illegible],000. McLaughlin & Burr, 88 Tremont St., Boston, engrs. Noted Oct. 8.

N. R., Albion—ATTENDANT'S HOME, etc.—Dec. 10, by Commissioner Correction, State Office Bldg., Albany, attendant's home, [illegible] house, remodeling gymnasium, Institution for Mentally Defective Women; adv. E.N.-R. Nov. 26.

N. Y., Attica—CELL HOUSING, etc.—Dec. 8 (extended date), by Dpt. Correction, State Office Bldg., Albany, north cell housing, reception and disciplinary building, auditorium and chapels, school building, covered way and arcades, service connections, Attica State Prison; adv. E.N.-R. Nov. 26. Noted Nov. 19.

N. Y., Elmira—CELL BLOCKS—Dec. 22, by Commissioner Correction, State Office Bldg., Albany, remodeling interior Cell Blocks A and B, New York Reformatory.

N. Y., Peekskill—ARMORY—Dec. 8, by Adjutant-General, Div. Military & Naval Affairs, Capitol, Albany, state armory. Noted Sept. 24; adv. E.N.-R. Nov. 26.

Ont., Guelph—PUBLIC—Dec. 10, by N. Desjardins, secy. Dpt. P. Wks., Ottawa, public building. $150,000.

CONTRACTS AWARDED

Del., Dover—STATEHOUSE—E. W. Martin, archt., Room 402, DuPont Bldg., Wilmington, general contract 3 story, basement, brick, rein.-con., steel, plain found., to Allen L. Lauritsen Co., DuPont Bldg., Wilmington, $238,539; plumbing, heating and ventilating, to William D. Shellady, Inc., 1015 Lancaster Ave., Wilmington, and electrical work, to E. L. Jones & Co., Dover, $68,000. Noted Nov. 5.

N. Y., Bedford Hills—REFORMATORY—Dpt. Correction, State Office Bldg., Albany, general contract segregation building at reformatory for women to James McWilliams, 11 East 44th St., New York, $613,000; heating to Afgo Eng. Co., 42 Fulton St., New York, $103,723; sanitary work to J. Weil Plumbing Co., 328 East 33rd St., New York, $40,691; electrical work, to W. H. Tayerner Corp., 51 East 57th St., New York, $72,000. Grand total $829,414. Noted **Oct. 1.**

N. Y., Dannemora—CELL BLOCK—Commissioner Correction, State Office Bldg., Albany, east cell block, Sections C and D, to Amsterdam Building Co., 110 East 42nd St., New York, $562,777; heating to Afgo Eng. Co., 142 Fulton St., New York, $24,723; sanitary work, to Freyn Bros., 3850 Michigan Ave., Detroit, $58,732; electrical work, to O'Connell Electric Co., 63 Mount Hope Ave., Rochester, $15,489. Grand total $661,721. Noted Oct. 1.

N. Y., Ossining—PRISON—Dpt. Correction, State Office Bldg., Albany, general contract segregation building, to Wheeler Eng. Co., 369 Lexington Ave., New York, $172,300; heating, to J. Winkel, Larchmont, $6,641; sanitary work, to H. Homer & Sons, 1708 Gravesend Ave., Brooklyn, $11,220; electrical work, to Reliance Electric Co., Pleasantville, $3,268. Grand total $193,249. Noted Oct. 15.

Ore., Medford—COURT HOUSE—Jackson Co., general contract court house, to L. H. Hoffman, Public Service Bldg., Portland, $192,500; heating, to A. G. Rushlight, Portland, $12,693; plumbing, to Modern Plumbing Co., Medford, $8,600; electrical work, to Peoples Electric Co., Medford, $8,699; jail equipment, to Freis & Son Steel Constr. Co., Portland, $20,851; elevator, to Otis Elevator Co., 72 North 10th St., Portland, $5,750. Grand total, $249,093. Noted Oct. 1.

Pa., Norristown—EMPLOYEES OFFICE—Commonwealth of Pennsylvania, Dpt. Properties & Supplies, Harrisburg, J. L. Hanna, secy., general contract 3 story, basement, 71 x 137 ft., rein.-con., brick, plain found., at Norristown Insane Asylum, to A. W. Frank Co., Commercial Trust Bldg., Phila., $99,714; heating, to C. C. Kottcamp & Son, 515 West Market St., York, $7,384; plumbing, to Bulman Bros., 2501 North 5th St., Phila., $12,300; electrical work, to J. E. Spence, 1310 12th Ave., Allentown, $8,049. Grand total $127,447.

UNCLASSIFIED

PROPOSED WORK

Arkansas—ARMORIES—Arkansas State Military Dpt., c/o E. L. Compers, State House, Little Rock, plans by H. R. Burks, Wallace Bldg., Little Rock, and D. Kyle, Natl. Bank Bldg., Pine Bluff, 1 and 2 story, rein.-con., brick armory buildings in towns of Ashdown, Batesville, Camden, Dardanelle, El Dorado, Hope, Hot Springs, Nashville, Prescott and Walnut Ridge. $25,000 each.

Mass., Somerville—LEGION—Somerville Post American Legion, J. McCarron, chn. buildin

Unclassified (Continued)

com., soon takes bids 3 story, basement, brick, stone, steel American Legion Building, plain found. $150,000. J. P. Hefferman, 175 High St., Boston, archt. Noted Oct. 15.

N. J., Elizabeth — MAUSOLEUM — Corporation, c/o F. A. Reed, archt., 1221 East Grand St., revised sketches brick, steel, stone, plain found. $200,000. Noted Sept. 3.

N. J., Essex Falls—RAILROAD STATION, etc.—Erie R.R. Co., G. S. Fanning, ch. engr., 101 Prospect Ave S.W., Cleveland, O., sketches 2 story, basement, brick, steel, railroad station and post office. $150,000.

N. Y., New York—RESTAURANTS—Alice Foote McDougall, c/o A. Davis, in charge, 6 West 46th St., remodeling 25 buildings for restaurants.

CONTRACTS AWARDED

Mo., Kirkwood—POST OFFICE—G. F. Heege, 239 Way Ave., 1 story, basement, 32 x 110 ft., concrete, brick, Argonne Dr., to F. Baumstrak, 233 West Jewell Ave. Treas. Dpt., Wash., D. C., lessee.

N. Y., New York—DORMITORY—Sisters of Jean Baptiste, 184 Est 76th St., dormitory, to P. J. Brennan & Son, 624 Madison Ave., $125,000; heating, to Reis & Donovan, Inc., 255 West 28th St.; plumbing, to T. P. McLoughlin, Inc., 1059 Lexington Ave.; electrical work, to Leibfried & Hagan, Inc., 11 East 44th St. Noted Oct. 1.

N. B., St. John—PASSENGER STATION—Canadian Natl. Ry., C. S. Gzowski, ch. engr. constr., Montreal, Que., foundation walls, basement, ground floor beams and slabs, stair and partitions for new passenger station, to R. A. Corbett & Co., St. John. Noted Jan. 8.

Industrial Buildings

FACTORIES AND MILLS

PROPOSED WORK

Calif., Los Angeles—BOTTLING PLANT—Canada Dry Corp., 423 East 8th St., sketches fireproof plant. $40,000 or more.

Mass., Ipswich—BLEACHERY—Pequot Mills, Salem, remodeling, equipping former Ipswich Mills property for bleachery. $40,000. Lockwood Greene Engineers, Inc., 80 Federal St., Boston, engrs.

Mass., Lynn—FACTORY—North Shore Cutting Die Co., J. Hermanson, 898 Broad St., plans by B. Porter, 209 Washington St., Boston, 1 story, brick, steel addition, concrete found.

Mass., Quincy—OIL PLANT—Town River Oil Co., 36 Hill St., soon takes bids bulk oil plant, Town River, 30,165 bbl. capacity. Private plans.

Mich., Detroit—FACTORY—American Blower Corp., 6000 Russell St., 1 story, brick, rein.-con., steel fan factory, plain found., Tireman Ave.

N. J., Lyndhurst—PRINTING PLANT—Commercial Leader Co., F. Burnes, pres., 356 Valley Brook Ave., sketches 2 story, basement, brick, steel, Valley Brook Ave. $40,000 or more. Noted Oct. 8.

N. J., North Bergen—FACTORY—C. O. Epperson, c/o North Jersey Industrial Terminal Co., 1827 Bergen Turnpike, sketches 1 story, basement, brick, steel, on 100 x 390 ft. site, 39th St. $40,000. Private plans.

N. Y., Long Island City—ICE MANUFACTURING—Save Service Station, Inc., 852 Jamaica Ave., Jamaica, 1 story, 73 x 148 ft. ice manufacturing plant, Platewood Ave. and Long Island R.R. tracks. $45,000. Private plans.

N. Y., Millport—GAS PLANT—Keystone Gas Co., Inc., gas plant.

N. Y., Ridgewood—FACTORY, etc.—Muller Paper Goods Co., Prospect Ave. and Linden St. lets contract late in December altering and constructing 1 and 3 story, factory, office addition, Prospect Ave. and Linden St. $75,000. H. Bruckner, 2424 Myrtle Ave., archt. Noted Oct. 1.

N. Y., Sparta—GAS PLANT—New York Central Electric Corp., 61 Bway., New York, gas plant and distribution system, Livingston Co.

N. C., Greensboro—FACTORY—Pringle & Smith, archts., Norris Bldg., Atlanta, Ga., soon let contract 2 story, 78 x 120 ft., rein.-con., plain found., for Greensboro Coca Cola Bottling Co., Greensboro. $75,000. J. J. Sawyer, Greensboro, assoc. archt. W. C. Spiker & Co., McGlawn-Bowen Bldg., Atlanta, Ga., engrs.

O., Zanesville—FACTORY—Zanesville Stoneware Co., enlarging plant incl. annex to house modern equipment, installing new Harrop tunnel kiln for manufacture stoneware. Est. $75,000. Private plans.

Tenn., Loudon—HOSIERY MILL—C. H. Bacon Co. sketches hosiery mill. $40,000. Engineer not appointed.

Tex., Corpus Christi—CHEMICAL PLANT—Southern Alkali Corp., c/o H. A. Gault, pres., Barberton, O., soon award contracts for construction chemical plant on 389 acre site, near turning basin. $10,000,000. Contractors and Dealers, etc., get in touch with owners. Private plans. Noted Aug. 13.

Tex., Harlingen — FREEZING PLANT — Frozen Juice Corp., c/o B. F. Pitman, Harlingen, 1 story, quick freezing plant, 3,000 g.p.d. Private plans. Noted June 18.

Va., Goshen—TEXTILE MILL—Lockwood & Greene, engrs., 9 West 3rd St., Charlotte, N. C., soon lets general contract addition for Stillwater Worsted Mills. $40,000 incl. equipment.

Ont., Amherstburg—OIL REFINERY—W. F. Simrall Refining Corp., Union Central Bldg., Cincinnati, O., plans refinery, cracking units, etc., on Detroit River, taking bids on part of work. To exceed $40,000. To be known as Simrall Refining Corp. of Canada. Noted Nov. 5.

BIDS ASKED

Calif., Riverside—PACKING HOUSE—Eng. Dpt. Union Pacific System, Pacific Electric Bldg., Los Angeles, taking bids (selected list of contractors) brick, 4th and Vine Sts. $50,000. Architectural Dpt. of Owner, Pacific Electric Bldg., Los Angeles, archts. Noted Nov. 19.

Ill., Chicago — PLANT — See "Contracts Awarded."

N. J., Fairlawn—INDUSTRIAL PLANT—Owner, c/o J. C. Van Vlandren, archt., 140 Market St., Paterson, bids about Feb. 1, general contract 1 story, basement, brick, steel, Sherman Ave. $40,000. Noted Nov. 19.

Tex., Baird—REFINERY—See "Contracts Awarded."

Va., Charlottesville—TEXTILE MILL—Nov. 28, by Lockwood & Greene, engrs., 9 West 3rd St., Charlotte, N. C., general contract textile mill, for Charlottesville Woolen Mills. $100,000.

CONTRACTS AWARDED

Ill., Chicago—PLANT—Metal Package Corp., 110 East 42nd St., New York, A. Buschman, in charge, manufacturing plant, day labor and separate contracts. $150,000. Purchases now being made.

Ill., Hoopeston — FACTORY — Sprague-Sells Corp., M. Sells, mgr., general contract 1 story, irregular shaped, 80,000 sq.ft. floor space, to J. W. Montgomery, 708 Martin St., Danville. Est. $150,000.

Mass., Cambridge — MANUFACTURING — Simplex Wire & Cable Co., 66 Sidney St., altering and constructing 3 story, concrete addition, 79 Sidney St., to Chase & Gilbert, Park Sq. Bldg., Boston. Est. $40,000 or more.

Minn., Cloquet — FACTORY — Berst-Forest-Dixfield Co., H. Dickman, mgr., 3 story, 106 x 274 ft. factory, to James Leck Co., 211 South 11th St., Minneapolis.

Mo., St. Louis—ICE PLANT—Artificial Ice Co., 3715 Easton Ave., general contract 2 story, basement, brick, rein.-con., steel, to A. H. Stiel, 813 Chestnut St., structural steel, to Stupp Bros. Bridge & Iron Co., 3800 Weber Rd.

Tex., Baird—REFINERY—Octane Oil Refining Co., oil refinery, 1,500 bbl. daily capacity, 5 mi. from here, day labor. $250,000. Private plans.

Tex., San Antonio—LAUNDRY—Woodlawn Laundry, c/o F. C. Ender, 2117 Blanco Rd., 1 story, 60 x 90 ft., brick, tile, stucco, rein.-con., plain found. $40,000. Owner builds. Private plans.

B. C., Vancouver—RICE MILL—Canada Rice Mills Ltd., 343 Railway St., general contract rice mill, rein.-con., incl. wharf, storage warehouses, wood, pile founds., to Morgan & McKee, 119 West Pender St., $40,000; piling, to W. R. Jaynes Driving Co. Ltd., 726 Front St., New Westminster $22,000.

GARAGES

PROPOSED WORK

Mass., Boston—M. Greenspan, 161 Devonshire St., Boston, soon takes bids altering 2 story, irregular sized garage from terminal basement, concrete ramps to street, South Station. $40,000. Blackall, Clapps, Whittemore & Clark, 31 West St., archts.

N. J., Hackensack—Bergen Auto Co., F. W. Steffens, pres., 17 Banta Pl., bids about Feb. 1, general contract, 2 story, basement, brick, steel, garage, showrooms, Main St. and Hackensack Ave. $150,000. A. E. Dore, 173 Main St., archt. Noted July 16.

N. Y., Brooklyn—B. Finkel, 1936 79th St., service garage, Utica Ave. and Lenox Rd. $50,000. M. J. Ort, 424 East 149th St., New York, archt. **Maturity after Mar. 1.** Noted Sept. 3.

BID ASKED

N. Y., New York—See "Contracts Awarded."

CONTRACTS AWARDED

N. Y., New York—U. S. Trucking Corp., 17 Battery Pl., service garage, 41 East Rivington St., garage and service building, day labor and separate contracts. $40,000. P. Bardes, 230 Grand St., archt. Noted Nov. 12.

SHOPS AND FOUNDRIES

PROPOSED WORK

Minn., Minneapolis—WATER METER SHOP—City Water Works, Dpt. W. B. Heath, superv. water meter repair shop, 3rd St. between 2nd and 3rd Aves. $75,000. N. W. Elsberg, city engr.

CONTRACTS AWARDED

Missouri—MAINTENANCE—State Hy. Dpt., Jefferson City, to F. T. O'Dell, Hannibal, highway department maintenance buildings at Brookfield $4,647, at Hannibal $4,445; to C. F. Reinhardt, 2933 Edgar St., St. Louis, at Platte City, $4,815; Lexington $4,550, Warrensburg, $4,740, Sedalia $4,795, Vienna $5,100, Fulton $4,730, Waynesville, $5,190, to J. Hultgren, **Camdenton**, at Camdenton $4,839; to J. Rich, Cassville, at Cassville $4,475; to Day & Day, Ava, at Ozark $5,021; to J. O. Brown, Willow Springs, at Winona, $4,550; to Linus & Penzel, Jackson, at Jackson, $4,788. Grand total $66,685.

Neb., Curtis—SHOP—Bd. Regents, University of Nebraska, 1 story, 65 x 100 ft. shop at State School of Agriculture, to Busboom Co., Fairbury.

POWER PLANTS

PROPOSED WORK

Ia., Glidden—City, c/o M. Mereness, clk., received no bids Nov. 10, brick power plant, 17 ft. high, installing, furnishing two 150 hp. Diesel engines connected to 100 kva. 3-phase 60 cycle 2,300 volt generators with exciters, auxiliary equipment, tank, cooling system, 5 panel switchboard. Bond issue for same defeated. Henningson Eng. Co., 326-30 Union State Bank Bldg., Omaha, Neb., engrs.

Mass., Fall River—American Thread Co., T. R. Louis, Kerr St., plans by M. Curry, 260 West Broadway, New York (company's archt.), altering power plant, Kerr St. $40,000 or more.

Miss., Columbus—City Council sketches light plant. $150,000. Burns & McDonnell Eng. Co., 400 Interstate Bldg., Kansas City, Mo., engrs.

N. Y., Watson—Northern New York Utilities Co., Inc., Light and Power Bldg., Watertown, electric plant extensions, Lewis Co.

BIDS ASKED

Calif., Herndon—See "Contracts Awarded."

N. Y., Iroquois—Dec. 3, by Superintendent Standards & Purchase, Capitol, Albany, electric generating unit with connections, Thomas Indian School; adv. E.N.-R. Nov. 26.

CONTRACTS AWARDED

Calif., Herndon—San Joaquin Light & Power Co., A. E. Wishon, pres., Fresno, subsidiary Pacific Gas & Electric Co., approved plans constructing 50,000 kw. steam turbine generating plant. Owner builds by separate contracts. Work to start early in 1932. Est. $3,500,000. Project planned for 1930 construction was postponed owing to lower demand for power. Noted Mar. 13, 1930, under "Contracts Awarded."

Calif., Los Angeles—City Water & Light Dpt., City Hall, furnishing hydraulic and electrical equipment for San Francisquito Power Plant 2, incl. 17,500 kva. vertical type main unit generator, exciter electric generator direct connected to main unit, to Allis Chalmers Mfg. Co., 1117 Rowan Bldg. (delivery from Milwaukee, Wis.), $101,637; furnishing 3 single phase, step up, outdoor type transformers, oil filled, water cooled type, 5,833 kva. capacity each, to General Electric Co., 5201 Santa Fe Ave., $42,985; furnishing Francis turbine type vertical prime mover, complete with runner, wheel housing and water control mechanism to operate at 428 r.p.m. average flow 280 to 300 sec.ft., head 518 ft., to Newport News Shipbuilding & Dry Dock Co., 90 Broad St., New York, $74,305. Grand total $218,927. Noted Sept. 10.

Minn., Emmons—City Council, A. H. Rasmussen, clk., municipal light and power plant, to M. O. Hylbak. Est. $100,000.

N. Y., Elmira—Lamoka Power Corp., c/o G. R. Mills, Sodus, power plant, short of Lake Keuka, near here, separate contracts. $1,000,000.

WAREHOUSES

PROPOSED WORK

N. J., Newark—Lafayette Storage Co., 30 Liberty St., soon lets contract altering and constructing 3 story, basement, 60 x 135 ft., brick, steel rear addition to storage building. $150,000. G. E. Jones, 24 Commerce St., Newark, archt.

N. Y., Long Island City—Queensborough Gas & Electric Corp., 1610 Central Ave., plans by E. L. Phillips & Co., 50 Church St., New York, 3 story, 36 x 42 ft. storage and work office, Broad Channel Dr. and West 108th St. $60,000.

BIDS ASKED

N. J., Jersey City—Mahnken & Schultz, archts., 256 Summit Ave., Union City, new general contract bids about Jan. 15, revised plans 1 story, basement, 150 x 200 ft., brick, steel warehouse, Tonnelle Ave., for Culbert Pipe & Fittings Co., 170 8th St. $150,000. Noted Sept. 10.

CONTRACTS AWARDED

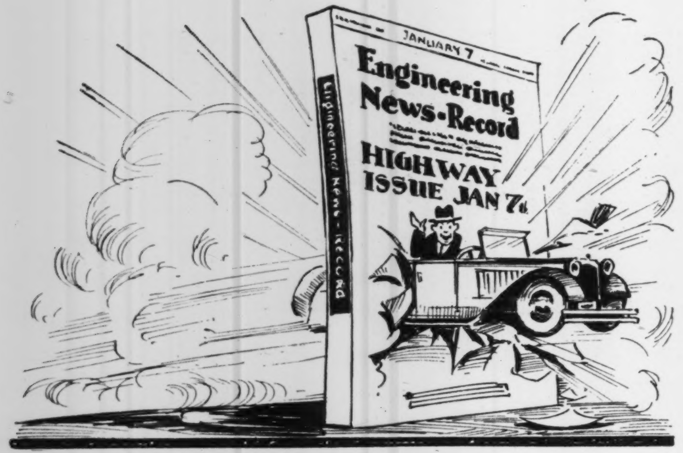
New York—A. W. Brandt, comr. Hys., **Albany**, county storehouse and office at Warsaw, to **Liberty & Corullo, Inc., Depew**, $12,435; county store-house and assistant's office at Cobleskill, to L. Wexler, 1134 Baker Ave., Schenectady, $13,965; also at Malone, to J. E. Cashman, Burlington, Vt., $12,690; heating in storehouse at Waterford to E. W. Thompkins Co., 22 Main St., Albany, $4,653. Grand total $43,743. Noted Sept. 17, under "Streets and Roads."

N. C., Charlotte—Atlantic & Pacific Co., warehouse and storage building, to J. A. Jones Constr. Co., Commercial Bank Bldg. $150,000.

N. C., Wadesboro—Wade Mfg. Co., 2 story, 82 x 165 ft. warehouse, to C. F. Ballard, c/o owner. Est. $60,000.

See proposal advertising on page 50

Getting into High



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